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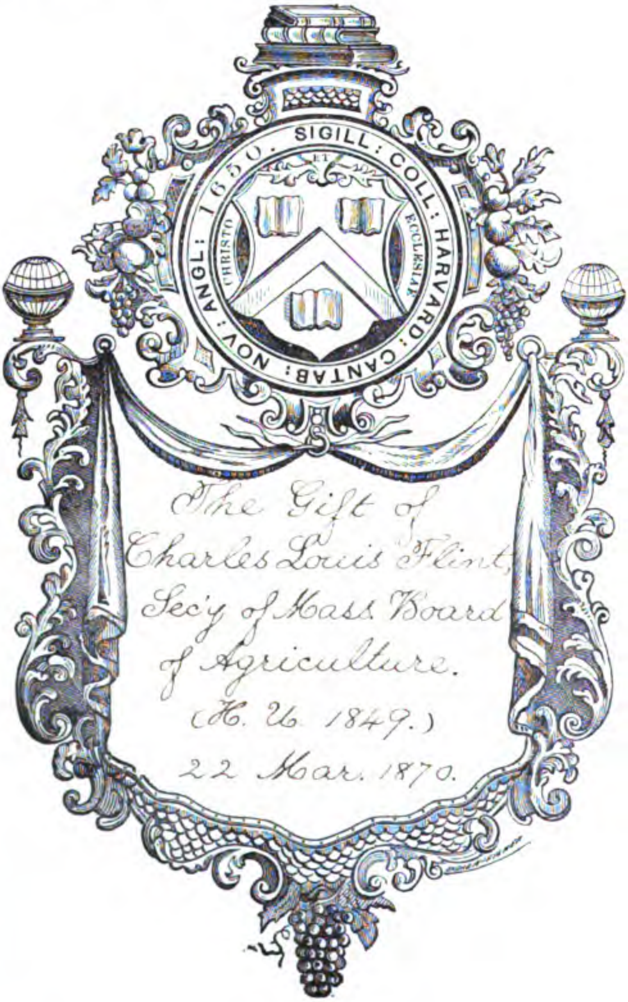
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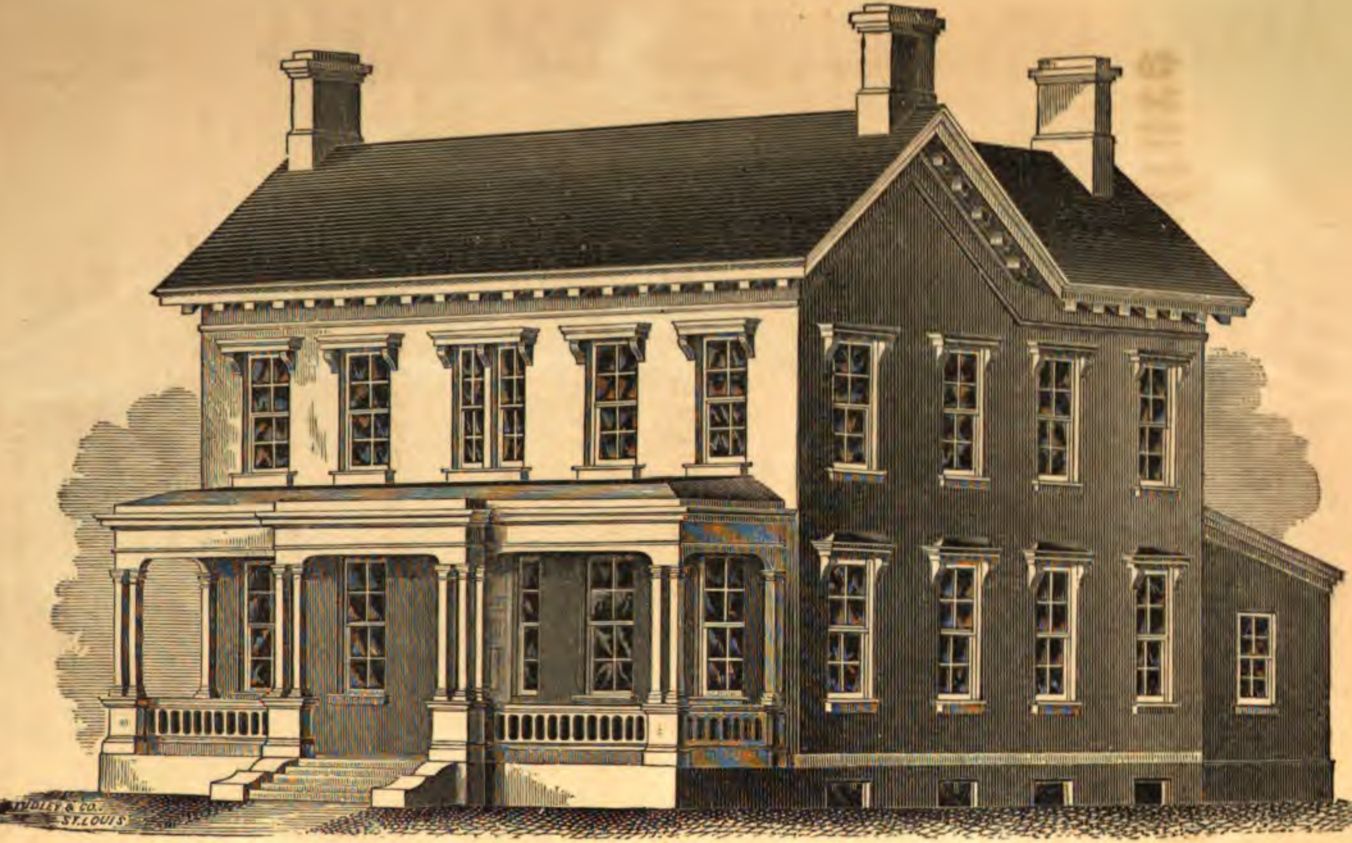
CHRISTO ET ECCLESIAE

The Gift of
Charles Louis Flint,
Sec'y of Mass. Board
of Agriculture.
(H. U. 1849.)
22 Mar. 1870.

C. L. FLINT,
Mass. Bd. Agr.
BOSTON



PERSPECTIVE VIEW OF FARM HOUSE,

DESIGNED BY THE LATE WM. RUMBOLD. FOR FLOOR PLANS SEE PAGES 174–175.

Fourth Annual Report

OF THE

Missouri

State Board of Agriculture

WITH AN

ABSTRACT OF THE PROCEEDINGS

OF THE

COUNTY AGRICULTURAL SOCIETIES

FOR THE YEAR 1868,

TO THE

GENERAL ASSEMBLY.

EDITED BY L. D. MORSE, M. D.,
EDITOR (ST. LOUIS) JOURNAL OF AGRICULTURE.

JEFFERSON CITY:
ELLWOOD KIRBY, PUBLIC PRINTER.
1869.

Sci 1635,52

1870, Mar. 22.
Gift of
Charles Louis Flint,
Secy. of Mass. Board
of Agriculture.
(H. U. 1849.)

MEMBERS OF THE BOARD FOR 1869.

Governor JOSEPH W. McCLURG	Ex-officio members.
T. A. PARKER, State Superintendent of Public Schools	
HENRY T. MUDD, President	Kirkwood.
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BARNABAS SMITH	Cuba.
N. J. COLMAN	St. Louis.
WM. STARK	Louisiana.
GERT. GŒBEL	Washington.
JOHN H. TICE, Recording Secretary	St. Louis.
C. W. MURTFELDT, Corresponding Secretary	St. Louis.

NOTICE.

This, the fourth agricultural report of the State, is considerably larger than any of the preceding reports, and it is confidently believed will be found proportionably more valuable. The increased size, and the much greater amount of reading matter contained, is due, first, to the report of the State Entomologist; second, to the somewhat lengthy proceedings and debates of the American Convention of Cattle Commissioners which was deemed of so great importance to the State as to warrant its incorporation; third, the valuable agricultural lectures which we are favored with from the Illinois Industrial University; fourth, the horticultural proceedings are more lengthy than usual, as well as more valuable in well prepared reports and addresses. In order to include the large amount of valuable matter and not make the volume too unwieldy, the Public Printer thought best to condense it by printing a large part in smaller type than usual. Considerable matter that was collected and prepared for the report, has also been omitted.

In March, 1868, upon petition of the State Board of Agriculture and the State Horticultural Society, the General Assembly, by a concurrent resolution, authorized the appointment of a State Entomologist, requiring him to make an annual report to the Board of Agriculture, to form a part of the State Agricultural report. The Board nominated Mr. C. V. Riley, and his first report concludes this volume. It will be seen that he has made good use of his time and has spared no expense in making his report attractive, interesting and valuable not only to the practical farmer and horticulturist, but to the student of science. We hazard nothing in saying that his report will be read with great interest, as well for the curious history of insects which it gives, as for its practical teachings. The account given of the Periodical Cicada, or seventeen year locust, as it has been generally called, and which attracted so much attention the past year, is new and more complete than anything heretofore published on the subject. It is unnecessary to refer to other interesting points in the report. It will be found new and interesting.

Our farmers who have read the preceding annual reports will find in this one many subjects introduced and more or less thoroughly treated, that were not mentioned or but briefly so in the former reports. On the subject of bee management there are some valuable lessons from practical men of experience.

The article on Farmers' Homes, by Prof. Spencer Smith, of St. Louis, will be found interesting and valuable. It is an important subject and one upon which the majority of farmers as well as others probably need and desire sound practical advice quite as much as upon any other. The elevation or perspective view, and floor plans of a farm house which accompany the article, were designed more than a year ago, by Mr. Wm. Rumbold, of St. Louis, an architect of distinction, since deceased, expressly for the agricultural report of 1867, but were not placed in the hands of the engraver in time to be completed for that issue.

The design of a "Cheap Country House," of Canadian origin, will meet the wants of many who wish to build. Neither of these plans are in all respects free from faults, but they afford a desirable basis, to which additions and alterations may be made so as to adapt them to the requirements and wishes of very many who may contemplate building.

The Illinois Industrial Lectures constitute a valuable feature in this report, none the less valuable for the reading of Missouri farmers on account of having been delivered in Illinois. It is earnestly hoped that it will not be long before a similar plan for instruction will be introduced in our State.

The attention of our wool growers is invited to the very able and interesting lecture on "Sheep" by Mr. A. M. Garland, President of the Illinois State Wool Growers Association. Those who read the comprehensive essay of Mr. S. P. Boardman, on wool growing, in the report of last year will not be likely to neglect reading the few selections from his later writings in this.

In the report for 1865, a large space was devoted to the subject of dairying; and its importance to the farming interest of the State was urged. Within the past year, a number of cheese factories have been started in the State. The first season's experience with the one at Chillicothe, Livingston county, owned by Gen. J. H. Hammond, has proved quite satisfactory. We are indebted to Prof. J. W. Hoyt, Secretary of the Wisconsin State Agricultural Society, for proof sheets of the very able address on "The Dairy: its products, methods and profits," by X. A. Willard, M. A., of New York, delivered at the Wisconsin State Fair.

Want of space prevents a reference to many other very valuable articles.

The County Reports are rather meagre. Less effort was made the past year than usual, to induce those most interested to attend to their own interests in the matter. It will be seen that but few of the county societies have recognized the requirements, or the beneficence and importance of the State law in regard to county societies and the Board of Agriculture; hence, but few of the societies have made any reports. That they will see, in course of time, that it is for their interest to do so, is highly probable. The counties of Pike, Montgomery, Jefferson, Washington and Webster have county societies organized in accordance with the State law, and the secretaries have made very interesting and valuable reports. They are respectfully commended to the attention of other societies. That of Mr. Clark, of Washington county, gives some valuable mining and lumber statistics.

This volume is quite profusely illustrated, which, it is thought, will add much to its interest and usefulness. It is respectfully submitted with the confident belief that it will be found, in most respects, an improvement upon the reports of preceding years.

L. D. MORSE,
Corresponding Secretary.

FEBRUARY 1st, 1869.

BOOKS, PAMPHLETS AND PAPERS

RECEIVED BY DONATION AND EXCHANGE.

From Hon. Horace Capron, Commissioner, copies of the report of the Department of Agriculture for 1867, and monthly reports of the same.

S. L. Goodale, Saco, Maine, Secretary Maine State Board of Agriculture, copies of the Maine Agricultural Report for 1867.

Charles L. Flint, Boston, Mass., Secretary Massachusetts State Board of Agriculture, copies of the Massachusetts Agricultural Report for 1867.

Colonel B. P. Johnson, Albany, New York, Secretary of the New York State Agricultural Society, Transactions of the Society for 1867; Report of the Utica Plow Trial; Journal of the Society, monthly.

T. S. Gold, West Cornwall, Secretary of the Connecticut State Board of Agriculture, copies of the Connecticut Agricultural Report for several past years.

——— ——— Providence, R. I., Secretary, Transactions of the Rhode Island Society for the Encouragement of Domestic Industry.

John H. Klippart, Columbus, Ohio, Secretary of the Ohio State Board of Agriculture, copies of the Ohio Agricultural Report for 1867.

Sanford Howard, Lansing, Michigan, Secretary Michigan Board of Agriculture, Michigan Agricultural Report for 1867.

A. J. Holmes, Indianapolis, Ind., Secretary Indiana State Board of Agriculture, Indiana Agricultural Report for 1868.

John P. Reynolds, Springfield, Ill., Secretary of the Illinois State Agricultural Society, copies of Illinois Agricultural Report for 1867; Report of the Commissioners to the Paris Exposition; Report of the Society's Commissioners on Texas Cattle Fever.

J. M. Shaffer, M. D., Fairfield, Iowa, Secretary Iowa State Agricultural Society, copies of Iowa Agricultural Report for 1867.

MAGAZINES.—Horticulturist, F. W. Woodward, New York, American Journal of Horticulture, J. E. Tilton & Co., Boston, Mass.; American Agriculturist, Orange Judd & Co., New York; American Farmer, ———, Baltimore, Maryland.

AGRICULTURAL PAPERS.—Prairie Farmer, Prairie Farmer Company, Chicago, Ill.; Journal of Agriculture, L. D. Morse & Co., St. Louis, Mo., Rural World, N. J. Colman, St. Louis, Mo.

NEWSPAPERS—State Times, Kirby & Cooper, Jefferson City, Mo.

RECORD OF THE PROCEEDINGS

OF THE

MISSOURI STATE BOARD OF AGRICULTURE.

JEFFERSON CITY, January 31, 1868.

Pursuant to a call issued by the President in conformity to the resolution adopted at the meeting held at St. Louis, on the 6th ultimo, the Missouri State Board of Agriculture met.

There being present—Messrs. N. J. Colman, Gert. Gœbel, O. A. A. Gardner, G. C. Swallow, and H. T. Mudd, President, of the incorporated members, and his excellency, Thomas C. Fletcher, Governor, and T. H. Parker, Superintendent of Public Instruction of Missouri, ex-officio members.

Absent—Messrs. W. S. Dyer, W. T. Essex, George Husmann, O. H. P. Lear, J. W. Harris, Frederick Münch, and B. Smith.

The minutes of the last meeting were read and approved.

Colonel Colman submitted the following resolution, which was adopted, and Messrs. Colman, Gardner and Gœbel appointed the committee raised by the resolution:

Resolved, That a committee of three be appointed to correspond with Governor Fletcher, Professor Swallow, R. S. Elliott, and J. W. Sutherland, and solicit from them copies of their interesting and able addresses delivered in the Hall of the House of Representatives, on Thursday night, the 30th of January inst., for publication in the Annual Report of the State Board of Agriculture.

Mr. Gardner offered the following resolutions:

Resolved, That in the opinion of this Board it will be impolitic, at present, to urge the sale of the Agricultural College Lands, and that the governing power of the Agricultural College, when established, should have power to provide for the lease of the lands on a plan similar to that adopted by the State of Iowa, and that said lands ought to be exempt from taxation until actually sold, they being properly school lands.

Resolved, That before the sale or lease of said lands, they should be appraised by competent persons, and should not be sold, nor leased for less than $1 25 per acre for those outside of the railroad belt, and $2 50 per acre for those within said belt.

Governor Fletcher offered the following additional resolutions, as an amendment:

Resolved, That the Agricultural College Lands should be protected from trespassers by a provision of law, punishing by imprisonment, as well as fine, all persons guilty of such trespasses.

Resolved, That the Register of Lands be required to prepare and preserve in his office, plats and tract books of the lands when patented to the State, for the Agricultural College, and that all sales or leases of said lands be certified to the Register of Lands, and patented by the State to the purchaser; or if leases be given, that they be recorded in the office of the Register of Lands.

Mr. Gardener accepted the amendment, and the resolutions as amended were adopted.

Mr. Colman submitted the following resolution, which after some discussion was adopted:

Resolved, That in the opinion of this Board, the location of the Agricultural College should be left to free competition for bids to be made by the citizens of any district, county or city; but that it would be inexpedient to accept any bid, unless the amount secured by *bona fide* subscription shall be equal to three hundred thousand dollars; and if that sum is not offered, in the opinion of this Board the said Agricultural College should be located and made a separate Department of the State University.

On motion,

The Board adjourned.

J. H. TICE,
Recording Secretary.

ST. LOUIS, April 7, 1868.

At a meeting of the Missouri State Board of Agriculture, called by the President, there were

Present—Colonel N. J. Colman, of St. Louis county; Dr. W. S. Dyer, of Jefferson county; Wm. T. Essex, of St. Louis county; O. A. A. Gardner, of Jefferson county; and President H. T. Mudd, of St. Louis county.

There not being a quorum present, the Board adjourned to Wednesday, the sixth day of May next, at 10 o'clock A. M.

JOHN H. TICE,
Recording Secretary.

ROOMS OF THE MISSOURI STATE BOARD OF AGRICULTURE,
Wednesday, May 6, 1868.

At the adjourned meeting of the Missouri State Board of Agriculture held this day, there were present as follows: Col. N. J. Coleman and W. T. Essex, of St. Louis County; George Husmann, of Gasconade County; John W. Harris, of Boone County; Gert. Goebel, of Franklin County; O. A. A. Gardner, of Jefferson County; O. H. P. Lear, of Marion County; and President Henry T. Mudd, of St. Louis County.

Absent: Messrs. W. S. Dyer, of Jefferson County; Frederick Muench, of Warren County; G. C. Swallow, of Boone County; and Banabas Smith, of Crawford County.

Mr. J. W. Harris offered the following resolution, which was adopted:

Resolved, That this Board endorse and confirm the action of the members, taken individually, in nominating to the Governor for appointment, Mr. C. V. Riley, as State Entomologist.

On motion of Col. Colman,

Resolved, that the compensation of Mr. Riley, as State Entomologist, be fixed at $2,500 per annum.

And resolved further, that as Mr. Riley entered upon the discharge of his duties on the first day of April, of the current year, therefore, that his compensation commence at that date, and that the President and Secretary issue warrants on the Treasurer accordingly.

President Mudd presented the following resolution, which was adopted:

Resolved, that the compensation of the Corresponding Secretary be fixed from the first of May instant, at $1,400 per annum, and that of the Recoding Secretary at $75 per annum.

On motion of Mr. Lear, it was

Resolved, that the President appoint a Committee on Agricultural College, to report to the Board at some future time, what legislation, if any is necessary, for making the Agricultural College Lands available for the speedy organization of the Agricultural University.

The President appointed Messrs. Lear, Morse, Tice, Colman, Husmann, and Harris.

On motion, the President, Mudd, was added to the said Committee.

On motion, the Board then adjourned.

JOHN H. TICE, Recording Secretary.

BOARD OF AGRICULTURE,
Wednesday, Dec. 2, 1868.

This being the day fixed by Statute for the Annual Meeting of the Missouri State Board of Agriculture, there were present: Col. N. J. Colman, of St. Louis County; Dr. Wm. S. Dyer, of Jefferson County; Wm. T. Essex, of St. Louis County; J. W. Harris, of Boone County; O. H. P. Lear, of Marion County; Henry T. Mudd, of St. Louis County, and B. Smith, of Crawford County, of the incorporated members, and Wm. Stark, President of the Agricultural and Mechanical Association, of Pike County, ex-officio member.

Absent: Geo. Husmann, of Gasconade County; Gert. Goebel, of Franklin County; O. A. A. Gardner, of Boone County; Frederick Muench, of Warren County, and G. C. Swallow, of Boone County.

The minutes of the last meeting were read and approved.

Col. Colman called attention to the fact that heretofore no report has been made of the discussions before the board on the measures proposed. He thought it ought to be done, as the subjects would then be presented to the public in all its bearings. In the reports of other States, he finds there is generally embodied a synopsis of the discussions of the board.

Mr. Tice, Recording Secretary, stated that he had, as would be perceived by reference to the published proceedings of the board, given the leading points that were made by members, but found it almost impossible to give a connected report of discussion, because the members generally offer their resolutions verbally, which he had to reduce to writing, and while doing so could not follow the discussion. But if it is the desire of the board to report the discussion he would do so.

Mr. Colman, continued. At the present meeting there is but one President of a county agricultural society present, which he presumed was because these societies had not been notified of the present, the annual meeting of the board. He said so, because he as a member of the board had not been so notified, and he did not find any member that had.

Mr. Tice, the Recording Secretary, stated that the by-laws made it the duty of the Corresponding Secretary to conduct all the correspondence with individuals and societies, which always was so construed as include notification of members, etc.

As an accommodation, at the request of the Corresponding Secretary he had on certain occasions written out notices to members of the board, and would have done so on the present occasion if he had been requested to do so by the Corresponding Secretary, though no part of his duty, as would be evident by an examination of the by-laws.

Mr. Colman, continued. I supposed it was the duty of the Corresponding Secretary to issue these notices, but as I had received none, and I can find no member of the board who has, I suppose there was either a neglect or oversight of duty somewhere, and I wish to call the attention of the board to it, that it may be attended to hereafter.

Members of the board are complaining of a want of interest on the part of the agricultural community, because the latter was lending but little assistance to the great objects to be promoted by the board, but he believed that a great deal of the blame attaches to the board itself in not giving due publicity of the time and place of the annual meeting, and especially in not giving notice to the county agricultural societies.

Dr. Dyer thought that there might be an improvement made in the manner of getting up our annual reports. Of all the State reports he had seen he thought that of Massachusetts the best, and he would like to see our reports brought out in a similar manner.

Mr. Lear. My connection with the board is only limited, and while I would find some fault with the manner in which the board has had its business done, he must equally condemn the almost total indifference of the agriculturists in the great questions which the board repeatedly presented to them for their consideration without receiving any response. He especially alluded to the establishment of the agricultural college. There is no greater question can come up than that of agricultural education, yet it has elicited no attention any where. If the present generation of agriculturists are indifferent to a special education to qualify them for their industrial pursuit, there would soon rise up another generation who would take a more enlightened view of it, and would demand it. But at present he almost despaired exciting any interest in it.

President Mudd, said, it is well enough to find fault, because it showed dissatisfaction, and when men are dissatisfied with the conduct of affairs, there is hope for improvement. The best way to make improvement is for us to take hold earnestly of the work ourselves. The laws defined the powers and duties of the board, and also those of the county societies. He regretted that the latter had not yet been brought into intimate relation and co-operation of the board, but this could be effected in time if the members of this board acted with becoming zeal and energy. Much had already been accomplished, though not all that was desirable. The work was large, and it required time as well as diligence to execute it. Through the instrumentality of the influences of the board, the legislature last winter made an appropriation that enabled the board to employ a State Entomologist, to unravel the mysteries of insect life in our State, and to enable the cultivators of the soil to fight these their worst enemies intelligently and to mitigate their destructiveness. Also, the first report of the board had been extensively sent to Europe by the Board of Immigration, and it has done much good in bringing immigrants to our State. I think, also, that the legislation exclud ng officers of horticultural societies from membership in the board was unwise, because it has debarred the most devoted and enthusiastic cultivators of the soil from co-operating with the board, and he hoped they would be restored.

Dr. Dyer—Conviction precedes reformation, and as we had now all been brought to the confessional, he hoped we would bring forth fruit mete for repentance.

Mr. Colman—While much of the short-comings of the Board might be owing to members of the Board themselves, yet he believed that the main officer of the Board, the Corresponding Secretary of the Board, should devote his whole mind and energy to promote the work entrusted to the Board. For if he did not, it was not likely that he would infuse enthusiasm into others. Such an officer we have in our Entomologist. Mr. Riley. He did not wish to find fault with Dr. Morse, because he had all the preliminary work to do for an organization of the agricultural interest of the State. Under the circumstances, perhaps, he had done all that could have been expected of him. But the last year or two he was conducting private enterprises which occupied too much of his time, and he had heard that he was not ready with his annual report.

Mr. Mudd said Dr. Morse told him, before leaving for Springfield, where he is now attending the "Cattle Convention," that his report was in progress of preparation, and would be ready early in January for the Public Printer.

In justice to Dr. Morse, I will also state that last year, he informed me, his private business demanded so much attention that he felt he could not hold his present position longer than to the close of the year.

Mr. Essex, Treasurer, submitted the following report, which was accepted and referred to a committee consisting of Messrs. Smith and Dyer:

WM. T. ESSEX, TREASURER, IN ACCOUNT WITH MO. STATE BOARD OF AGRICULTURE.

	Dr.		
Dec. 3, 1867	To amount of balance		$ 584 45
April 11, 1868	To amount of Auditor		5,100 00
	Total		$5,684 45
	Cr.		
Dec. 2, 1868	By amount paid, as per vouchers inclosed	$3,892 85	
	Balance on hand	1,791 60	
			5,684 45
	To balance brought down		1,791 60

Mr. Tice, the Recording Secretary, submitted the following copy of the transactions of the Executive Committee, as having audited and issued warrants on the Treasurer for the following accounts during the year:

Dec. 6, 1867	H. T. Mudd, per order of Board		$ 25 50
Jan. 4, 1868	J. H. Tice, salary		12 50
	L. D. Morse, salary	$166 66	
	do cuts	5 2	
	do for ½ cord wood	6 7	
			178 61
6	Office rent		75 00
Feb. 3	J. H. Tice, salary		12 50
	do expenses to Jefferson City and back		15 25
	L. D. Morse, salary	166 66	
	do sundries	2 50	
	do express charges	50	
	do expenses to Jefferson City	10 50	
			180 16
March 2	J. H. Tice, salary		12 50
	H. T. Mudd, expenses to Jefferson City		10 75
April 3	J. H. Tice, salary		12 50
6	Office rent		75 00
15	L. D. Morse, salary	333 33	
	do Studley's bill	80	
	do express charges	1 90	
	do wood for office	5 25	
	do postage stamps	5 00	
			346 28
30	C. V. Riley, State Entomologist, salary		208 40
May 1	L. D. Morse, salary		166 66
	J. H. Tice, salary		12 50
	O. A. A. Gardner, expenses in attending meeting		11 00
	O. H. P. Lear, " "		15 00
June 2	L. D. Morse, salary		116 67
	Express charges		3 50
	Postage stamps		5 00
	J. H. Tice, salary		6 25
	C. V. Riley, salary		208 40
July 1	do "		208 40
	L. D. Morse, salary		116 66
	do express charges		1 50
	J. H. Tice, salary		6 25
6	Office rent		75 00
28	L. D. Morse, salary		116 70
August 1	C. V. Riley, salary		208 40
	J. H. Tice, salary		6 25
29	C. V. Riley, salary		208 40
Sept. 29	do "		208 40
30	J. H. Tice, salary		12 50
Oct. 5	Office rent		75 00
10	L. D. Morse, salary		233 35
27	C. V. Riley, salary		208 40
Nov. 5	L. D. Morse, salary	116 66	
	do expenses	8 60	
			125 26
	J. H. Tice, salary		6 25
Dec. 1	L. D. Morse, salary		116 65
	J. H. Tice, salary		6 25
	J. W. Harris, expenses in attending meeting		15 00
	Total		$3,892 85

Mr. Riley, State Entomologist, stated that his report was not quite ready, but far advanced in progress, and would be finished in ample time for the Public Printer. In order to work effectively, he had to do much preliminary work, and to make his report the better understood, he had spent about eight hundred dollars of his individual funds for engraving, to illustrate the report.

Resolved, That the State Board of Agriculture is highly gratified at the indefatigable and untiring exertions of the State Entomologist, Mr. C. V. Riley, who has devoted his entire time to the duties of his office, in collecting and disseminating timely and valuable information on the subject of injurious and beneficial insects.

Resolved, That in consideration of the immense sums annually lost to the agricultural population of our State by the work of insect foes, and of the great importance of this office, we deem the action of the last Legislature in creating such an office eminently wise, and earnestly request the coming Legislature to continue the requisite appropriation to this board.

The next business in order being the election of members to fill the vacancies occurring by expiration of term of service.

The Recording Secretary laid before the board a list of the members, together with the length of their term of service, from which it appeared the term of service of the following members terminated with the present annual session of the board:

That of Dr. Wm. S. Dyer, of Jefferson county; of Henry T. Mudd, of St. Louis county; of Frederick Muench, of Warren county, and of Barnabas Smith, of Crawford county.

The board then went into an election, Messrs. Colman and Lear acting as tellers, which resulted as follows:

First. Dr. Wm S. Dyer, of Jefferson county, to fill the vacancy occasioned by expiration of his present time of service.

Second. Henry T. Mudd, of St. Louis county, to fill vacancy by expiration of his present time of service.

Third. Wm. Stark, of Pike county, to fill the vacancy occasioned by the expiration of the time of service of Frederick Muench.

Fourth. Barnabas Smith, of Crawford county, to fill the vacancy occasioned by the expiration of his present term of service.

Dr. Dyer, from the committee to whom the treasurer's document was referred, reported that the committee had examined the said account and accompanying vouchers, and found the same correct, and that the balance of cash on hand is one thousand seven hundred and ninety-one dollars and sixty cents.

On motion, the annual meeting of the board then adjourned.

JOHN H. TICE.
Recording Secretary.

MEETING OF THE NEW BOARD.

Office of the Missouri State Board of Agriculture,
St. Louis, Dec. 2, 1868.

The Missouri State Board of Agriculture met pursuant to notification.

It was temporarily organized by appointing John W. Harris, President *pro tem.*, and John H. Tice, Recording Secretary *pro tem.*

The roll being called the following members were found to be present:

Norman J. Colman, of St. Louis county; Wm. S. Dyer, of Jefferson county; Wm. T. Essex, of St. Louis county; John W. Harris, of Boone county; C. H. P. Lear, of Marion county; Henry T. Mudd, of St. Louis county; Wm. Stark, of Pike county; and Barnabas Smith, of Crawford county.

Absent—Messrs. Geo. Husmann, of Gasconade county; Gert Goebel, of Franklin county; O. A. A. Gardner, of Jefferson county; and G. C. Swallow, of Boone county.

There being a quorum present, the President *pro tem.* stated the first business in order was the election of President.

Mr. Mudd was put in nomination.

Mr. Mudd stated that he had served as President ever since the organization of the Board, much against his inclination and wishes, and he desired to be relieved. He always thought that he was not the right person for the position, as the cultivation of the soil with him had only been incidental and subordinate to his other business. He should like to see the position of President of the Board conferred upon one whose whole life has been spent upon the farm in devotion to agricultural pursuits. He, therefore, would nominate Mr. C. H. P. Lear, of Marion county.

Mr. Lear remarked that while he was at all times willing to take his share of the work and responsibilities of any position in which he might be placed, but in the present instance he believed we had the right man in the right place; he, therefore, most respectfully must decline the proffered honors, and would second the nomination of Mr. Mudd.

A ballot was then had for President, Messrs. Colman and Smith acting as tellers, which resulted as follows:

Henry T. Mudd	7 votes
O. H. P. Lear	1 "

Mr. Henry T. Mudd having received a majority of the votes cast, was, therefore, declared duly elected President of the Board for the ensuing year.

The next in order was the election of Vice President.

A ballot had, Dr. Wm. S. Dyer having received all the votes cast, was declared duly elected Vice President for the ensuing year.

A ballot was then had for Treasurer, when it appeared that W. T. Essex had received all the votes cast, Wm. T. Essex was therefore declared duly elected Treasurer for the ensuing year.

A ballot was then had for Recording Secretary, and J. H. Tice having received all the votes cast, was declared duly elected Recording Secretary for the ensuing year.

For Corresponding Secretary, Mr. Mudd nominated C. W. Murtfeldt. A ballot being had and it appearing that C. W. Murtfeldt had received all the votes cast, he was declared duly elected Corresponding Secretary for the ensuing year.

Certain bills were presented for expenses incurred by members while attending the meetings of the Board, which were referred to to the Executive Committee, to be audited and warrants issued therefor.

On motion, the Board then adjourned *sine die*, subject to the call of the President when deemed necessary.

JOHN H. TICE,
Recording Secretary.

REPORT

OF THE

CORRESPONDING SECRETARY.

REPORT OF THE CORRESPONDING SECRETARY.

To the General Assembly of the State of Missouri:

Another year has rolled around, and it becomes my duty to lay before you the fourth annual report of the "condition of agriculture throughout the State," and such other information as the law requires and is deemed important and useful as contributing to the agricultural welfare and progress of the State.

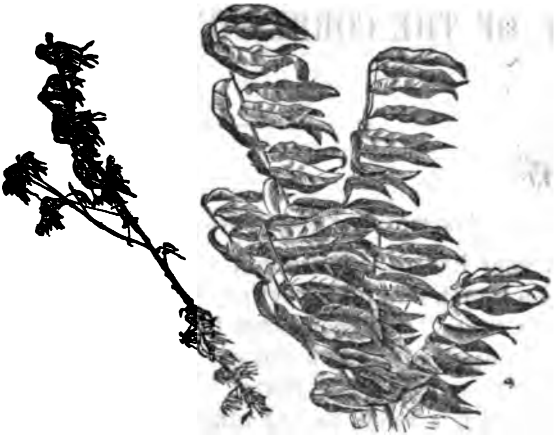
The part year has been one of remarkable prosperity. The seasons were mainly favorable, and the yield of nearly all crops unusually abundant. The only serious failure was in apples. In a few counties in the central western portion of the State there were fair crops ot apples, but in most parts there was as serious a failure as has probably ever been known to occur. In many of our best peach growing regions that crop was unusually short, while in other localities there was an over-abundant yield. In two or three counties next north of the Missouri river, where peaches are not much grown for market, and where the varieties are mostly seedlings, there was an enormous yield, tending to confirm the prevalent opinion that seedling peaches are much the most certain, and suggesting the importance of having, for family use especially, a supply of such varieties as nearly reproduce themselves from the seed. Prominent among these may be named the Heath-cling, and especially the Columbia and other yellow fleshed varieties.

The prospect for peaches was good until just at the time when they were in blossom, when a cold rain fell, turning to sleet and covering the trees with ice. In our best peach regions the main crop was destroyed. Those that lived suffered severely from the curculio.

Some of our horticulturists, accompanied by Dr. Hull and others, from Illinois, visited in the fall some of the peach orchards of Jefferson county. They discovered in one orchard there, the existence of a very serious disease, well known to Eastern peach growers as "The Yellows." It has been found within a few years past in Southern Illinois, where it was introduced by trees brought from the east, and is rapidly spreading. The disease is not well known in the West, this being the first instance of it that has come to my knowledge in this

State. Peach growers should be on their guard, and wherever it appears, eradicate it, root and branch. Much trouble and loss may be prevented by acting promptly in season.

THE YELLOWS.



The cut here represented was engraved from a photograph taken in the orchard of Mr. Bainbridge, near DeSoto, in Jefferson county. The lower branch in the cut shows a natural, healthy growth, the upper one is affected by the yellows. Small spurs have been thrown out at each leaf bud, covered with small diseased leaves, paler in color than natural. Both branches were upon the same tree. As the disease advances the whole tree becomes affected and dies. The following is what is said of it in Thomas' American Fruit Culturist:

The disease termed the yellows is truly formidable. It is peculiar to the peach and nectarine. It has destroyed whole orchards in portions of the country, and for a time induced the entire abandonment of peach culture in certain localities.

The cause of this malady has not been satisfactorily ascertained. According to conjecture, it has arisen originally from exhaustion by deteriorated soil, overbearing; and neglected pruning and bad cultivation. But whatever may have been its origin, it appears at present to be chiefly communicated from diseased trees. It is quickly induced by inserting the bud from an affected tree into a healthy stock. It spreads by contact with diseased roots; a knife used in pruning the tree will infuse the poison if used on another. It appears to be communicated without actual contact, the healthy branches nearest a diseased tree being usually first attacked. It is also probable that the stones from diseased trees cause its development after a few years' growth. Its highly contagious nature, when in its most virulent form, is indicated by the equal facility with which young and vigorous trees, and old and feeble, may be inoculated by contact.

Its infallible indications are, first, *premature ripening of the fruit*, some weeks earlier than usual—accompanied with a rather insipid flavor, *purple discolorations of the flesh.* These usually occur the first season, and on a part of the tree which has been first inoculated with the poison. The following season, numerous small wiry shoots are frequently thrown up from the larger branches, the leaves become yellow, the whole tree assumes a sickly appearance, and eventually perishes. No instance is known where a decidedly developed case of this disease has ever been cured. When once attacked, to prevent a spread of the disease, the tree should be immediately removed and burned. No young trees should be planted on the same spot, as the diseased roots still remain. Stones for seedlings should be procured from districts of the country where it has not been introduced.

In some parts of the country, possessing a strong fertile soil, as, for instance, portions of Western New York, this disease has not spread extensively when introduced from abroad. It has generally destroyed a few trees near the affected ones, and has then disappeared.

Dr. Hull made a report on the subject to the Illinois Horticultural Society in December last, of which the following is a copy:

Robust and vigorously growing trees are generally the last to be attacked by the yellows, but when they once become affected they are soonest killed. The ends of the branches cease to grow, the leaves become of a yellowish hue and drop off, when numerous small branches like those from which they sprang are also in like manner checked in their growth and in turn produce from the axil of their leaves other and much smaller branches, until some of the masses or clusters of branches so produced become so spindling and compact as to resemble some of the larger mosses more than branches of the peach. In this manner the trees at midsummer or later become leafless and die, while the roots to all appearance are in a state of comparative health. Trees attacked late in the season in which the leaves have performed their natural office, show the disease only in the veined and yellowish appearance of the leaves. The roots of these trees in the following spring look much as that part of healthy roots would look which had been bared to the light and air, being in color between that of roots and branches, but in this respect resembling most the latter. Even the smallest roots present more or less this appearance, and in the early season are destitute of those small warty excrescences from which new rootlets and spongioles are formed. Hence it seems impossible that the roots should aid the growth of the tree, except by absorption and moisture, as when the trees are in a state of rest.

The yellows appears to be carried by bees from infected to healthy trees, while the trees are in bloom. In the orchard of the Winter Brothers, at Duquoin, we found several peaches, one side of which was to all appearance in a healthy condition, while the affected hal ripened several days earlier than the healthy side; the early ripened half had those peculiar yellowish dots on the surface and the reddish stain of the flesh that always so conspicuously marks the fruit of diseased trees. The Winter Bros., after many years experience with the yellows, inform us that they are of the opinion that it is highly contagious, the disease being conveyed by pruning trees in health with tools that have been used on infected trees, also by the plow. To settle this point I selected a vigorous peach tree in my own orchard of the Old Mixon variety, and macerated in water some of the specimens taken from one of the De Soto orchards of Missouri. We placed this substance in contact with the alburnum. In about two weeks the leaves nearest the main branches began to show the yellowish veining of the leaves, and a few days later the young and partly grown leaves near the end of the branches also assumed the peculiar yellowish tints characteristic of the disease; the growth of all the branches was arrested. From the base of the leaves on a few of the most succulent shoots a few new shoots put forth, the leaves of which were soon checked as before described. Were we to leave this to grow on another year the skin of the fruit would be dotted over with yellowish dots and the flesh streaked and colored with the peculiar pale logwood red—a characteristic mark of the yellows—and ripen two, three or even four weeks earlier than on healthy trees, and by the first of August the tree would be lifeless without the power of perfecting a single healthy leaf. In this condition the tree, being destitute of new roots and spongioles, is starved for the want of food.

In view of the facts of which mention has been made, nurserymen should be vigilant and not select their seeds from unhealthy trees, nor from districts even where this disease is known to exist.

The practice now so common, of purchasing seeds of the canning establishments, should also be abandoned, and districts known to be healthy sought from which to obtain a supply.

In the latter part of the month of February and most of March the weather was quite favorable for early plowing and the sowing of spring grain. It is well known to all, except it be new settlers, that in order to secure a good crop of oats or spring wheat in this climate, it is necessary to sow early; the latter part of February or the first of March. Farmers generally improved the favorable weather last spring and a large breadth of spring grain was sown, which made a heavy growth, in many cases too heavy to stand up. Personal visits to several portions of the State in the month of June, afforded me occular demonstration of splendid crops of wheat, oats, and the meadow grasses especially. Corn was not in all cases so promising. On land somewhat gravelly or sandy corn was generally good, while on the heavier clay lands, the rains in May especially had retarded the planting, and it was difficult to get such land in good condition for planting in the proper season.

The character of the season and crops, the hopeful and progressive views of our farmers, in short, the bouyant condition of our agriculture has been very agreeably shown in the letters from correspondents in various parts of the State. Mr. Albert Badger, of Vernon county, wrote under date of February 21st as follows:

"We have had beautiful spring weather for a full week. Many dark streaks are now perceptible, traversing the near and distant farms, many too distant to bring to view the busy plow, which has commenced its yearly duty of persuading mother earth again to yield the staff of life. Can anything buoy up or give more courage to labor than the scene in view from our county seat:—eight miles of prairie, seemingly level as the ocean; in the back ground, elevated mounds rising gradually to the hight of thirty feet, dotted on their sloping sides and tops with farms and white cottages, the most distant, resembling painted ships upon a painted ocean. One would believe that such a country must fill up and become settled in a few months, without other inducements than such scenes. Soon the iron horse will be here, too, from St. Louis, or perchance Chicago, groaning under the task of exchanging supplies for surplus. Then the land in this beautiful valley will be sought for by farmers, with many regrets that opportunity has been procrastinated until its value placed it beyond their reach. Much of it is composed of black limestone soil, which has no superior for grain or pasturage. I am informed by Mr. J. S. Birdseye, of this place, that he has now fifteen thousand acres of this and other lands in this county, for sale to actual settlers from $3 to $6 per acre. This is an opening for the farmer which they will, perhaps, never again have presented."

A gentleman of St. Louis, who traveled through the whole extent of South Missouri in February and the first part of March, gave a very favorable account of the wheat crop throughout the whole extent of his travels. A larger breadth than usual had been sown in the fall, and the crop was generally in a fair condition. The following is a specimen of a report of the prospects in North Missouri:

TRENTON, Mo., March 28, 1868.

"I have just returned from a trip through Grundy, Mercer, Putnam and Sullivan counties. Never saw a finer prospect for a crop of fall wheat. Fields not large, but every farmer has sown some. Peach trees will bloom abundantly. Stock of all kinds have been well wintered, and the farmers have hay enough left for half another winter. The spring has been fine so far, and our farmers are plowing with a will." Respectfully,

J. H. SHANKLIN.

From Oregon, Holt county, April 2d, Mr. W. Kaucher wrote:

"This morning, at sunrise, the thermometer stood 21.50°, unusually cold for the season. Ice formed from one-fourth to one-half of an inch thick. As usual we are told 'this is the coldest weather we ever had here in this month,' but I have been 'looking up' the record and find that on the 6th of April, 1867, the mercury stood at 9°, and on the 4th of April, 1859, it was down to 8° Fah. But even 21.50° is too severe to 'brag' of, especially when vegetation has such a start as it has here to date. Fortunately it came in a dry time, the apricot and service berry were about the only things actually caught out, but a few days more of warm weather would have brought out the peach, plum, pear, and other fruit blossoms, so far that their destruction would have been inevitable.

"The young grasshoppers, those recently brought into being, have hopped their last hop, and will trouble us no more forever. We can afford to lose some fruit to enjoy the satisfaction of having them nipped.

"Wheat is looking fine in the Northwest. There is not much fall wheat, the grasshoppers having destroyed nearly all of it last fall. A large quantity of spring wheat was sown, the most of it in February; it is now up and growing fine, and promises a good crop.

"Farmers in this section are more forward with their spring work than usual. A large part of the corn ground is now ready for planting, and many of our farmers had made arrangements to commence planting this week, but the cold weather of this morning will delay the time somewhat."

On the mornings of the sixth and seventh of April, ice was reported in Vernon county a quarter of an inch in thickness. Peaches were thought to be killed in orchards not protected by timber. From the adjoining county on the south, Jasper, date April 16th, the report came that "peach trees are in full bloom, and the prospects are favorable for a full crop. Apples, plums, cherries, gooseberries, and strawberries are in bloom, with favorable prospects for a full crop. The elms, hackberry and redbud timbers are putting on their summer dress. In fact our forests are beginning to look quite summer-like. The gardens are looking fine; most of garden vegetables are up, and large enough to begin to cultivate—such as potatoes, onions, peas, beans, beets, etc., etc. Our prairies are looking finely, covered in beautiful green grass and flowers. Our herds of young cattle and horses are out on the range, feeding themselves. Many of the farmers are nearly ready to plant their corn. Some few of them have planted a portion of their crop. Our farmers are preparing for large crops, with a view of meeting the demands of a large immigration, which threatens us from every quarter."

A careful observer in Callaway county, Mr. Huron Burt, date, April 25th, sent the following interesting statement:

"We have had an extraordinarily early spring. The season is a month or more in advance of last spring, and the mean temperature much greater. Farming operations have opened much earlier this than last spring. The sowing of oats was a month and a half earlier, and corn planting nearly a month. The leafing and flowering of fruit trees and flowering shrubs has taken place, too, nearly a month earlier than last year.

"Wheat, rye, oats and grass are generally looking well, and forwardness of the spring has induced some of our farmers to sow spring wheat. It came up well, and is looking very promising, so far as I have learned. Our present fruit prospects are good. The peach trees bloomed in such profusion as I never before knew, and such as would have crushed every tree, could every bloom have produced fruit. But immediately after the bloom commenced opening the weather suddenly changed, and reduced the temperature to 26 deg., which killed a very small portion of fruit, and a few days later a still severer change took place that reduced the temperature to 20 deg., which killed perhaps three-fourths, or more, of the peach crop, all the most forward portion of the bloom, a portion of the pears, and all the sweet cherries. The peach bloom has been just three weeks in opening, and the bloom has this peculiarity in being much the most deeply colored that I have ever known. (What has occasioned this ?) There is an abundance of fruit left, if it is not injured so much as to cause it to drop. The plums, pears and cherries bloomed in a like profusion with the peach. The apple will likewise be unusually full of bloom. The flowering almond, too, has bloomed more beautifully than I have ever known it. Every branch is a perfect plume; but unlike peach blossoms they are paler—less deeply colored than usual.

"We don't feel safe on the fruit question yet, for there is so much rain just now there is great danger of the weather fairing off with frost.

"The mean temperature for March was 50°, max. 87° on the 25th, and min. 12° on the 3d. There were 16 cloudy and 15 fair days. Rain on 1st and 5th (with thunder and lightning), 6th, 7th, 9th, 10th, 11th, 12th, 19th, 25th, and 26; and snowed an inch on the night of the 1st, and snowed and misted all day on the 27th, frosted on the 20th and 29th.

"The mean temperature of April was a fraction lower than March, being 49½°; max. 80° on the 22d, and min. 20° on the 5th. Everything was frozen stiff on this morning, and the ponds iced over, the ice being more than a half inch thick. There were 19 cloudy and 11 fair days. It snowed most of the day of the 8th, the snow remaining on the ground an inch thick over night and next day. It sleeted most of the 9th, and rained the 12th, 13th, (some thunder), and incessantly on the 14th, with thunder and lightning; some rain 16th and 24th, and perfect floods of it on the 25th, 27th and 28th."

"The mean temperature of March, last year, was 31°, and April 43°, so we have 19° in favor of March and 6½° for April this spring.

"The following are the dates of leafing and blooming of some of the fruits and shrubs and plants of the Nine Mile Prairie; March 15, common sweet honeysuckle in leaf; 18th, crocus in bloom, wild gooseberry in leaf; 20th, lilac in leaf; 22d Dr. Arnold rose in leaf; 23, Houghton seedling gooseberry in leaf; 24th, carmine rose in leaf; 25th, apricot (Breda) in bloom; 28th, hyacinth in bloom; 30th, Chinese evergreen and Japan white honeysuckle in leaf; 31st, some scattering peach bloom; April 1st, Siberian crab in leaf; 10th, Belle de Fontenay raspberries and yellow flowering currants in leaf; 11th, wild gooseberries in bloom, and white winter pearmain apple in leaf; 12th, Nonpareil do; 17th, flowing pear in bloom; 19th, Black Tartarian and American amber cherries in bloom; 20th, peach and many plums in full bloom; 21st, St. Germain, Steven's Genesee and Napoleon pears and yellow currants in bloom: 22d, flowering almond do; 23d, sugar, Dearborn's seedling, and other pears in bloom; 24th, Houghton's gooseberry and golden drop plum in bloom; 25th, sweet June royal pearmain and some seedling apples and Morello cherry in bloom; 29th, Rambo, red June, Michael Henry pippin, early harvest, and Father Abram apples in bloom; 30th, golden pippin, white winter permain, maiden blush, small winter romanite, and vandevere apples, and Mayduke and Early Richmond cherries in bloom. The Geniton will not be in bloom for some days yet."

June first, he wrote again:

"We have been drenched with oft repeated rain during May, which has seriously retarded the planting of corn; notwithstanding the early start that we had, the first of June finds us not all done. The rains have been so distributed as to keep a great deal of ground designed for corn a little too wet to work without being injured. The larger portion of corn planting was completed, however, about the middle of May, and I think corn is generally coming well, thus mostly doing away with the very troublesome job of re-planting. 'It is an ill wind that does not blow any good,' so we must feel somewhat compensated with the fine prospects for small grains and grass for the disappointment in our failure to get corn planted early. Wheat, oats and meadow grasses have taken a very luxuriant growth. Insect enemies are less complained of thus far this spring than usual. What are termed, in common parlance, bud-worms and wire-worms, are the greatest depredators complained of; they are at work on the corn crop to some extent; I surmise that the heavy rains have had something to do with this. The chintz bug was feared at one time, for they abounded in rather threatening numbers, but there are none to be seen now.

The mean temperature of May was 59°; max. 89° on the 5th, and min. 42° on the 8th, There were sixteen fair days and fifteen cloudy ones. There was rain on the 2d, 4th, 5th, 6th (with thunder), 10th, 11th, 26th and 28th—this latter accompanied with heavy thunder, and was the greatest fall of water in ten years, vessels standing in the open yard (buckets and jars) were filled six inches, and small streams that scarcely are ever so full that a man could not jump over them, were twenty to thirty feet wide, and tearing gaps through fences that crossed them two to four panels wide. The principal part of the water fell in two hours, though it rained after the main dash moderately the remainder of the afternoon. This is the first time for years that we have failed to have any frost at all during the month of May; so we have a very fair fruit prospect. Many of the peach trees and plums will be rather too full; but the apple and pear, and cherry have been too much thinned, generally, by the fruit dropping."

A correspondent in Franklin county wrote, May 18th:

"The protracted wet weather has done considerable damage to fruit crops in our county—mostly to apples; many kinds that set full having dropped almost their entire crop. Among the kinds most injured are Yellow June, Vandevere and Winter Pearmain; among those not injured are Pryor's Red, Rambo, Fall Pippin and Queen, while Genitons and Yellow Bellflowers, and some other kinds are partially injured. Strawberries are also materially injured, their ripening delayed, and lacking in flavor. Much corn is not yet planted; wheat and oats are not much damaged; weeds growing rapidly, while one grand universal impossibility of plowing (for mud) prevails."

HENRY COUNTY, May 10.

"We have had a fine spring for business. Nearly all are done planting corn; some of it is large enough to plow, and it has come up well as far as I have noticed. Wheat and oats look well. Plenty of peaches, but apples did not bloom very freely generally. Altogether, the prospect is encouraging."

J. R. G.

About the same date, Mr. Kaucher, of Holt county reported:

"Pears, cherries, and apples seem to have been injured by the freezing of this month; while the prospect for an abundant peach and grape crop is good.

"Grasshoppers are hatching in great numbers in many localities, and promise to do the usual amount of damage.

"Spring and fall wheat looks well, and if the expected depredations of the aforesaid hoppers are not taken into consideration, will yield an abundant crop.

"Wild geese, brants, pelicans, and cranes so numerous during last month and the early part of this, have moved northward, and very few are to be seen now."

JASPER COUNTY, May 28.

"Since the 10th up to this date the weather has been dry and quite cool a portion of the time, The last few days the weather has been too warm for comfort. Corn is growing rapidly, although a rain would be beneficial to its growth. Most of the farmers are plowing corn the second time. Wheat looks well considering the drought last summer and fall, and we will be able to make a half crop. Oats and potatoes look fine. Potatoes (early) have been in bloom for the last ten days. Green peas in the market quite plentiful. Fruit prospects never better, provided the locust don't destroy it. Our country is flooded with them, every bush, tree and shrub are covered with them. Their noise is continual and almost deafening. Fourteen years ago this spring they paid us a visit, and did considerable damage to fruit trees in timbered situations. They pierce the small limbs, thereby weakening them so the weight of the fruit breaks them off. Even the wind at times blows them off. Would like to be informed as to their whereabouts in their fourteen year's absence.

"Price of produce—Corn 40 cents per bushel; flour $6 50 per 100 pound; bacon 20 cents.

"Farm hands $20 per month. E. M. B."

From Marion county, June 5th:

"The locusts made their first appearance here about the 25th of May; they have become quite numerous in some neighborhoods, but there are few places where they are doing any damage to anything but the forest trees. Our wheat is headed out, and is very fine; prospects of a large yield. We are having a great deal of rain; ground wet; weeds growing finely; some still planting corn between showers. Prospect of about half a crop of apples and peaches; grapes doing well. Yours, etc. S. F. T."

The following was received from Clinton county under date of June 10th:

"Wheat, if not injured by present wet weather causing it to take the rust, will be very fine. Oats and grass are very promising. A large crop of corn was put out, and came up well—one of the best stands I ever saw; and notwithstanding the recent heavy rains, generally in good condition, but unless we have some fair weather now it will in short time become very foul, as the weeds and grass are coming up very thick. Never saw a finer prospect for potatoes; the first planting are now in bloom; so far have seen very few of the Colorado Potato Bugs; they were plenty here in 1865 and 1866, not so many in 1867, and this year hard to find one.

The prospect for fruit is not as flattering as it was a month since. The seedling peach trees are very full; the budded tree have a few—nothing like a crop. Pears bloomed well, but set very little fruit. Apple trees were very full of bloom, but from some cause the fruit has dropped off, until we shall have but a modern crop. Cherries about ditto, or less—that is Early May and Morellos; other sorts a failure. Raspberries—Doolittle's Black Cap, Purple Cane, and Philadelphia loaded with fruit. Gooseberries—Houghton's Seedling, full of berries, but worms have taken them, so that the crop is worthless. Currants have done better. Lawton Blackberry—canes all winter killed. Grapes—Concord, T. Bullitt, H. Prolific, Catawba and Isabella all wintered finely, and are now loaded with fruit."

Morgan county, June 13th:

"Wheat is doing well. Rains have been just right to develop straw and head, and now the fine weather will hasten the ripening. Week after next will probably hear the ring of the reaper.

"The locusts have been here in crowds, and enough are left for company. It is thirteen years since they were here before—so says a good neighbor, a farmer's wife—the very year Charley was a baby.

"Cherries, usually abundant here, have almost wholly failed. Peaches promise well."

Shelby county, June 15th:

"As no one within my knowledge more competent has reported the state of the weather, crops, etc., of this section of the country, I will endeavor to furnish a few items applicable to the matter. Not having been favored with an opportunity for extensive observation, I durst not venture an opinion much beyond the limit of my own immediate neighborhood, being some five miles from Shelbina on the Hannibal and St. Joseph railroad, and on the route between that town and Paris, in Monroe county, Missouri, a distance of seventeen miles.

"I will just remark here that after some nine months of general parching drought, and five weeks smart winter weather, bringing us down to the middle of February, spring, with all its joys, appeared to burst upon us with surprising loveliness; farmers commenced operations, and some wheat was sown; but a change in the weather put a stop to further proceedings for a period. The rains commenced the first day of March, and frequent showers occurred during the month, also through April and May. Agriculture here generally looks exceedingly promising. On riding out a few miles recently, I was surprised to see the amount of surface under wheat, both fall and spring wheat, and, from what I can learn, far surpassing in extent all precedent in the history of the country.

"The breadth of oats sown is enormous, and looks very encouraging. The area of corn planted is large, but generally got in late, on account of the wet spring, and consequently backward; but the present genial weather and growing season we anticipate will partially, at least, obviate the matter, and secure to us a fair crop. Potatoes bid fair, though somewhat drowned out and seed-rotted.

"The fruit crop, I regret to say, gives but little encouragement, except peaches, which promise an abundance. The apple crop will probably but little, if any, more than suffice for the consumption of the producer. Cherries and berries of nearly all sorts will, we apprehend, afford but a scanty supply.

"The grass crop bids fair to be a bountiful one.

Yours truly, JOHN MAGEE."

The farmers of Audrain and Boone counties were reported, middle of June, quite backward in finishing up their corn planting. Many were subsoiling raw prairie and planting it in corn! They were going ahead with their breaking, notwithstanding the continuous wet weather, but could do nothing at planting, for neither horse nor man could get across the plowed ground, only by floundering through mud.

The farmers are resolutely determined to plant corn, however, if they can succeed in doing so at any time before, or by the first of July.

The practice of subsoiling raw prairie for corn is not uncommon among prairie farmers of some localities, and it generally proves satisfactory. A thin slice of sod is turned over, and then another plow, properly a trench plow, follows in the same furrow, throwing up the earth on top of the sod. This gives a tolerably mellow surface, and if the season does not prove to be too dry, a good crop will be produced. A farmer in Montgomery county, last spring, plowed forty acres of raw prairie, with a single pair of mules, to the depth of five or six inches, without subsoiling, harrowed it, and planted in corn, obtaining a fair crop. It was prairie which had been considerably "fed out."

With the report last mentioned, was forwarded an interesting account of an experiment in wheat culture, which may afford a valuable hint to those who are not very familiar with the management of raw prairies. It was in the following words:

"Mr. Bryant Barkwell, last June, broke up a strip of prairie for wheat, seventy-five yards wide and a quarter of a mile long. In September he found that the sod had rotted well, so he sowed a "land" twenty-five yards wide, right on the sod as it was, and then putting a heavy harrow, with four horses attached to it, on to the sod, he mounted the harrow and passed over it two or three times, tearing the sod to pieces thoroughly. It being so very dry, he was not satisfied with it, so he took his plow and plowed the next land of twenty-five yards wide as deep as he could make it go, sowing in the same manner, and harrowing as on the first land. But still he was not satisfied. The third land he broke by running his plow twice in the same furrow, as deep as he could make it go each time, and then sowed and harrowed as in the first instance. But the result is likely to be adverse to his expectations. The wheat on the first land came up well last fall; and the second, partially; and on the third, very little till spring. And now Mr. Barkwell thinks, if nothing happens to the wheat, the first land will yield at the rate of forty bushels per acre; the second twenty; and the third, on which he devoted so much labor, will make ten bushels per acre."

Vernon county, July 18th:

"We have had but little rain in this county for eighteen months, yet the wheat is good. I think wheat will become one of our staples. Oats is short and light, especially late sowing. Potatoes and corn begin to suffer severely—timely rains will make them more than an average, but another week's parching will be fatal to them, and to our inner man too. Strike down corn and you strike down king here."

Callaway county, August 1st:

"The wheat harvest of Callaway opened about the 18th of June, but wheat ripened so irregularly the cutting of it was prolonged to the 10th of July. The yield will be nearly equal to last year, on an average, per acre, for the county, but will not be of as good quality, owing to being injured by rust. The amount of wheat in the aggregate will perhaps be greater than last year, there being a greater breadth sown. Oats harvest commenced about the first of July. Oats, too, were irregular in ripening. The yield, too, will be greater than last year, averaging perhaps 35 bushels per acre. The harvest season has been rather showery, but not enough so to do material injury, so far. The corn crop is looking very promising, though much of it was planted late. The early planted corn is in tassel and silk. The early part of June was so wet as to prevent plowing, and harvest coming on at the time when the ground was dry enough, leaves much corn very "foul" (weedy). The mean temperature has been about 85 deg. since July 1st—so one can just about see it grow, and weeds and other things at a like pace. Such a uniform high temperature I have never known maintained in July for so long a period. June was of much more moderate heat, the mean being 72 2-5 deg; max. 94 deg., and min. 48 deg. There were five rains during the month, at one of which there was three inches fall of water. There were 22 fair days."

Clinton county, August 5th:

"The dry weather and white grub have made sad havoc with (at one time) the finest prospect for corn I have ever seen in the county. Hundreds of acres, especially sod land, will not realize the seed planted. The crop in the county will not make more than from fifteen to twenty bushels per acre. The ravages of the little intruder exceed anything of the kind ever seen in this county. Wheat will not make as much per acre as farmers expected. The crop will be larger, however, than ever before raised in the county, as the area sown was probably double that of any previous season. The oat crop is splendid—the best I ever saw grown in the county. The area sown was large, and the yield heavy. The potato crop is almost a failure—dry weather and the potato-bug have done their work. The hay crop was abundant, and was saved in good order. Fruit, probably one third of a crop."

Marion county, Hannibal, October 4th:

"We are having a much better crop of fruit this year than was expected in the earlier part of the season. Our crop of seedling peaches has been a large one; budded fruit only medium. Seedlings have sold as low as 25 cents per bushel; budded fruit $1 00. Seedlings have sold as high as $2 00, and budded fruit $5 00 per bushel. The apple trees are sparely set with fruit, but the apples will be larger and better matured than usual, and will fill the measure rapidly. Some of our orchardists that were willing to sell their crop in June for 100 bushels, have sold over 100 and will have three hundred more.

We are apt to over-estimate our losses and gains. The grape crop is excellent, especially the Catawba."

Cass county:

"December 6, snowed fast all day—averaged 12 inches deep—but there probably fell as much as 15 inches, since much of that falling first melted.

"December 10, at sunrise thermometer at zero.

"December 11, at sunrise thermometer 16° below zero.

"Corn in this county during this year averaged less than half crop; nevertheless the supply is sufficient for the demand. The price of corn here has generally been 50 cents a bushel—as low as 45 and as high as 60. During the recent bad weather it has advanced to 75 cents, but will fall again on the return of better weather. In counties south corn is scarce and prices higher. The wheat crop has been very fine this year. Peach crop also good. The apple crop is small—mine nearly a failure. The very dry weather during the early part of the season caused premature ripening and checked the growth; succeeding rains started a second growth—the consequence was the apples cracked, and many after rotted."

Ralls county, December:

"Our crops of all kinds for the past year have, as a general thing, been usually good. It would, I think, be safe to put the average yield of corn at fifty bushels per acre; wheat, twenty-five; oats, forty to fifty. These are the grains chiefly raised with us. The yield of rye, for the breadth sown (which was quite small), has been very good. Though our soil and climate seem to be well adapted to the growth of this grain, it is seldom raised among us as a market product, but is generally, to use the "clodhopper's" own terms for it, "hogged down" for the double purpose of improving both hogs and land."

"There is one little item connected with our season which I have heard spoken of, more particularly in this county, which may have some interest for the climatologist. It has already been stated that the crops, as a general thing, have been *very* good; but to the general rule there has been one quite strange exception. And though nearly every one would tell you that we had an abundance of rain and a fine growing season, yet there are those living in the county who would tell you that they, or rather, their crops, were literally burned up by the intense heat of three long, dry parching summer months, during which their burning thirst was not quenched by as much as one good refreshing shower, though they could behold their nearest neighbors in the fullest enjoyment of cooling, drenching, life-giving torrents. The 'dry streak,' as it was called, extended entirely through the county from the northwest to the southeast, varying in width from one and a half to two and a half miles. In this unlucky, rainless belt of country the corn crop particularly died of thirst, and the chinch bug rioted in all his withering glory; while on either side the growing season was most delightful, and this horrid pest that sticks so close to dry seasons and dry districts, was totally unknown. It would seem that prairie or timber could have nothing to do in this singular freak of nature, as the 'dry streak,' in its course through the country, passes over both the streams of Salt river and Spencer's creek, with their wide and heavy bodies of timber on both sides, as well as the large prairie extending from New London to Lick creek, and which lies between the two first mentioned streams.

"As to improvements, it may be safely said that but few, if any, old settled districts are going ahead faster than this. Loads of lumber and other building and fencing material may be seen going in all directions, and new houses are rearing their heads, and new farms are being opened out on all sides. But certainly rare inducements are here offered to the sturdy, enterprising immigrant. Improved farms can be bought for from $10 to $50 per acre, according to quality, locality, and improvements; while there are thousands of wild lands in this county to be had at from $5 to $20 per acre. Timber is abundant, coal abounds, especially in the western part. Water is plentiful, climate good, society good; and last but not least, there is a good market close by for all that can be produced." W. B. L.

Bates county, Missouri:

"There never was a better crop of wheat harvested in our county. Some fields went as high as 35 bushels per acre, and one 37, and this in a region where it was said wheat could not be grown profitably, until the Yankee invaded the county."

WHEAT GROWING IN CALLAWAY COUNTY.

WILLIAMSBURG, Dec. 7, 1868.

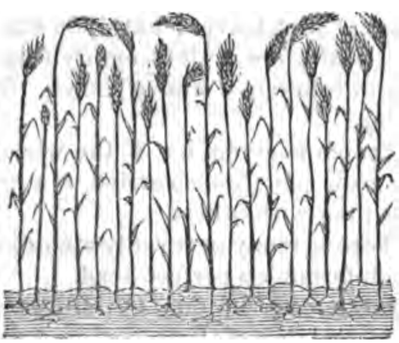
The production of wheat is commanding much more attention in our county at present than formerly. A few years ago the prevailing opinion was that this section was not adapted to wheat, and nearly half the farming community abandoned the raising of it, and the remainder only sowed small patches, ranging from one to ten acres—rarely reaching the larger figure—and for the most part put in the most primitive and slovenly manner. A common remark with those sowing was, "if what they had sowed did well, it would bread the family, and if it didn't do well there was enough seed thrown away." But now we have a complete revolution—a radical change of opinion in regard to the growth and production of wheat. Now almost everybody has sown, and instead of the small patches, twenty-five, forty and fifty acres are not unfrequent, and even greater quantities—one man in this township having sown one hundred and ten acres. Much better attention is given to the preparation of the ground. Unlike the manner of casting the seed on the ground and dragging the harrow or brush over it, or scratching it in with an old fashioned Cary plow, or some worn out plow that as equally failed to turn a furrow and "cutting and covering" largely; the custom now prevailing is to give two thorough, deep plowings, which stir, pulverize and comminute the soil completely, and then seeding with the drill, thus securing a much more equal distribution of the seed, and getting a much more even stand, and at a considerable saving of seed, and also with chances much in favor of its being less affected by the freezings and thawings of winter. The success attending wheat raising in the last two or three years has wrought the great change regarding wheat growing in this vicinity, and I still think, as I have for several years, that thorough and judicious preparation of the soil and careful seeding will almost always be rewarded with ample success, and with all the aids of improved farming implements and machinery and the better facilities of getting it ready for, and putting it into market, it must surely prove to be one of the most remunerative and profitable crops that can be produced here.

Most respectfully, H. B.

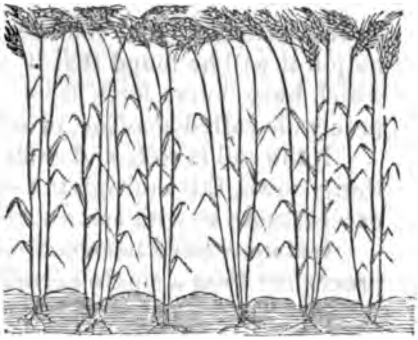
In a few of the more southern counties the wheat crop suffered somewhat from freezing out in winter, and also from rust, so that there was not a full yield, although more had been sown than usual. This was especially the case in Cape Girardeau county, a region where very superior wheat is grown. In that region it is estimated that more than double the amount of any previous year, is now sown in wheat. In all the fall wheat districts heard from or observed, the area sown the past fall is exceedingly large, and it has been noticed that a much larger proportion of it than ever before has been put in with drills. The demand for drills was so great as to quite exhaust the supply. This will unquestionably be an important improvement and one which will add immensely to the wealth of the State.

The experience of the last few years has proved that wheat planted with the drill produces a much better crop than the old method of sowing broadcast.

The drill deposits the seed at an even and proper depth; all germinates and comes up together; and being even distributed makes an even growth; and the roots being much deeper in the soil than in the case of broadcast sowing, the wheat is much less liable to be winter killed. There are other advantages in the use of the drill, and we are glad to see that farmers are beginning to appreciate them. One of the agricultural dealers in this city who sold only about 80 grain drills last year, has sold over 500 this year, and is not able to fill all the orders sent in.

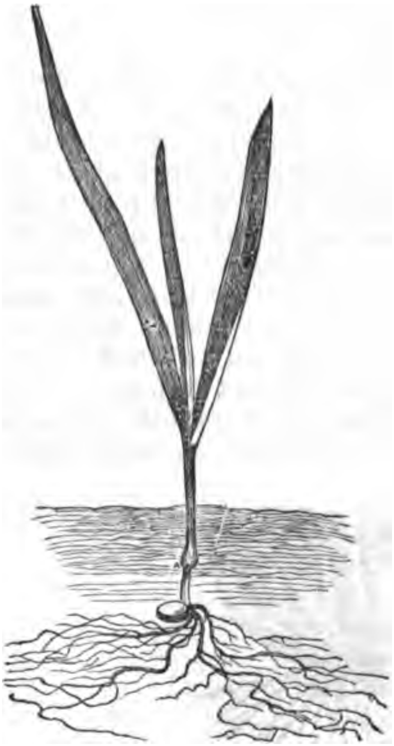


BROADCAST SOWING.

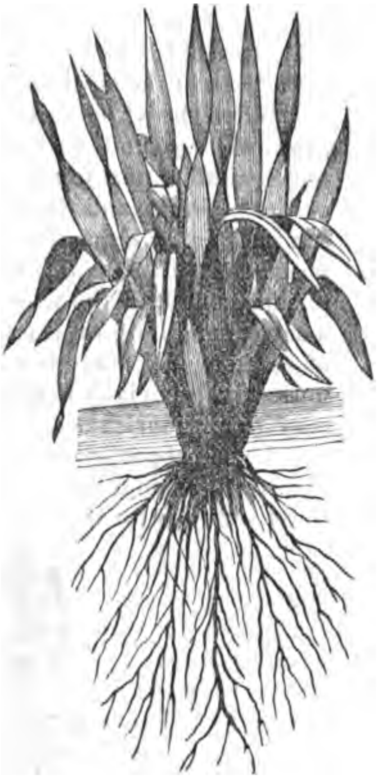


PLANTED WITH DRILL.

These two cuts illustrate the difference in the growth of wheat by the two methods of seeding. The cuts are from *Todd's American Wheat Culturist.* The three following are designed to show something of how wheat grows.



[Fig. 1.]



[Fig. 2.]

Figure 1 represents the plant a week or ten days after it comes up. Notice the net work of roots already formed—the full size of the seed yet remaining, and especially the protuberance at the surface of the ground.

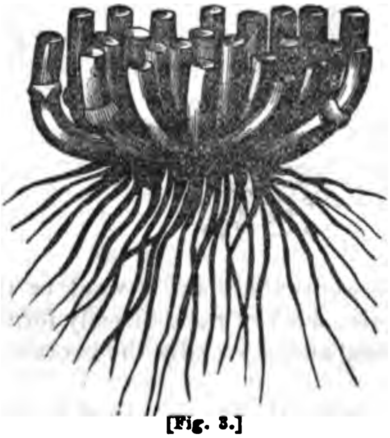
Figure 2 illustrates the next stage of growth. Apparently here is an indiscriminate and confused mass of root leaves; but upon examination it will be found that it consists of more or less embryo stems, which have burst forth from the protuberance above shown. This process is called *stooling*, or *tillering.*

If the soil is rich, and sufficient room is given, i. e. if the wheat is thinly sown, this multiplying of stems is sometimes carried to a great extent, more so with some varieties than with others.

Instances have been noticed where as many as seventy stems have proceeded from a single kernel, each forming a perfect head.

Mr. Todd relates the remarkable case of one C. Miller, who planted a kernel of wheat on the second day of June, and in August the plant had tillered so much that he was enabled to divide it into eighteen distinct plants, all of which were transplanted. After a few weeks, these had tillered to such an extent that the number of single plants put out before winter was sixty-seven. The next spring all these plants continued to tiller, until the number of growing stalks, from one kernel, amounted to five hundred. The soil was in an excellent state of fertility, and of course all the conditions in the case must have been of the most favorable kind.

When the *plumule*, or stem, in its embryo state is thus formed, it grows tall by the lengthening of the space between the joints, and not by adding new joints; the germ of the seed blossom is at the apex of the plumule, and this is carried up to receive the benefits of the sun and air, by elongation of the parts below. It will readily be supposed that, if in the tillering season a full supply of moisture exists in the ground, this process will be quite extensive; but if afterwards a severe and long protracted drouth should occur, this large number of stalks would make but a feeble growth, and mature the grain imperfectly, especially if there be not a deep soil to which the roots may go for nourishment; but as an ordinary fact the number of stalks will be so proportioned to the strength of the root that each will be vigorous and mature perfectly if the cultivator furnishes sufficient room and food for the roots.



[Fig. 3.]

Figure 3 illustrates the stubble, showing the form assumed by the stalks proceeding from a single kernel when they arrive at maturity and the root-leaves have perished.

It will be seen from the foregoing extracts from reports from different portions of the State, that spring wheat is grown to a considerable extent in the north part, principally north of the Hannibal and St. Joseph railroad, while south of the Missouri river it is seldom sown. In the few instances known to me of its trial in the latter region, it has failed to produce a good crop in every instance.

The reports show also that the meteorological conditions are quite various in the different parts of the State, and indicate the importance of careful observations in many different parts. Such observations continued for a series of years would undoubtedly develop important information.

THE WATER SUPPLY.

The importance of a good and convenient supply of water upon the farm can scarcely be overestimated. Pure water is about as essential to animal health as pure air. Many farms are well supplied with good water for stock by living springs and streams. Many others are not so fortunately situated. Thousands of farmers suffered great inconvenience during the drouth of last summer and fall for lack of water, both for stock and the family. Such an experience should be more potent than words in teaching them to provide a more ample supply for future contingencies.

PONDS.

On prairie farms and others where living water is not in good supply, and where the subsoil is retentive clay, ponds may be easily constructed by simple excavations, or by damming wet weather water courses, that will afford an ample supply of water, not of the very best quality, but still passably good. Such ponds may be shaded with trees, especially willows, but it is well to leave them sufficiently open that the water may be stirred by the winds and thus kept in better condition.

TUBE WELLS.

In some localities tube wells may be introduced with good success. An iron tube of perhaps two inches in diameter is driven into the ground until a stratum is reached that always contains water. A pump is then attached and a good supply of water often obtained. In some locations, where solid rock is too near the surface, or where the water stratum is at too great a depth, these wells are impracticable. The water from the tub wells is generally good, much purer than that from the common wells, because they get no surface drainage and the water generally comes from sand. It is said that artesian wells are readily obtained in some localities, and afford an abundant supply of water.

COMMON WELLS.

The most common resort, and the favorite one with most people for convenient water for domestic use, is the ordinary well dug down until water is reached and then walled up with rock. Many people think it a serious objection to a locality if water can not thus be readily obtained. There are serious objections to these wells, however, which few people seem to think of or consider. If closely covered they are liable to contain foul air, and this liability is not entirely obviated if they are open. In the latter case, frogs, toads, worms, and various objectionable substances find their way into them, rendering the water unwholesome. Numerous earthworms find their way into wells. The water in the soil next the well of course drains into it; the water from soil more distant follows to fill the vacancy, carrying into the well many impurities, so that the well is often little better than a cesspool of filthy water. In a deep, cold well, walled with rock, the worst of these impurities are deposited, so that they may remain unnoticed for some time. The water of city wells, where so much filth is collected upon the surface, is notoriously unwholesome, and its use commonly interdicted by the authorities during the prevalence of cholera. It is not unreasonable to presume that a large per cent. of the sickness in the country is caused by the use of impure water, so little attention is generally paid to this important matter. Earthworms may be kept out of wells by surrounding them with a trench three feet deep and a foot or two wide, filled with sand. The surface water, by filtering through this sand, will also be rendered comparatively pure.

CISTERNS.

Excepting distilled water, filtered rain water is the purest in the world, and this can easily be obtained upon every farm. No farmhouse ought to be without a good cistern, unless a living spring of pure soft water is quite convenient. If the spring is fifty yards off, a cistern would soon be paid for in the saving of steps, to say nothing of the saving of backs and arms, and the importance of having water convenient in case of fire. A good supply of soft water for domestic use, besides being conducive to health, is in the long run a great saving of soap and labor. It has been stated that the introduction of pure soft water from Loch Katrine into Glasgow, Scotland, saves to the inhabitants north of the river, in the article of soap alone, $150,000 per annum.

On every farm where there are roofs enough to shelter the household and the farm stock properly, enough water can be saved in the cisterns to afford an ample supply in nearly all cases.

HOW TO BUILD CISTERNS.

The cistern that is designed to supply the family with water for drinking and cooking, should be sixteen to twenty feet deep and eight to ten feet in diameter. It should be walled up with brick or stone; brick is best,—takes up less room and allows a good arch to be made at the top. If the earth is clay, sufficiently retentive to hold water, the cistern wall need not be plastered, but should be laid up in cement mortar. It is quite common to wall up cisterns, in retentive clay, without any mortar, but this makes them liable to the same objection we have stated against common wells,—they will drain the surface to the distance of twenty or thirty feet, as we know from trial.

The cistern for family use should be provided with a filter. This may be made by building a four-inch brick wall across the cistern from bottom to top, laid in cement, curving to the side which is to receive the water, and which should be about two-thirds the entire capacity of the cistern. The water will filter through the bricks of the partition, and may be drawn pure from the small compartment. Another good method, and probably the best, all things considered, is to dig a small cistern adjoining the main one, about five feet wide by six feet deep, connected about a foot above the bottom with the large one by a pipe. Fill this two-thirds full with sand and gravel, and let the water from the roof be discharged into it and filter through into the main cistern. The advantage of this method is that when the filtering materials become old or too impure, they may be taken out and renewed without disturbing or losing the water in the main reservoir. Very good cisterns of small capacity are frequently made in clay soil by cementing on the earth. A large, deep and substantial cistern, with a good filter, for family use, is invaluable for its supply of pure water.

PRAIRIE BREAKING.

BY SAM. P. BOARDMAN.

At your request, I sit down to write a short chapter on prairie breaking. Premising that I do not expect to write anything which may be new to Western men, I address myself altogether to "new comers."

The first impression of a man from the East on seeing a raw prairie in the fall or spring, when burned closed, is that there must be some mistake in the idea that it takes a strong team to break such sod; you see they don't see the roots. Right here, too, I would say that in the older sections of Illinois, and our other prairie States, the prairie yet "lying out" differs very much from the original virgin prairie. Where these open tracts are surrounded by farms which have been improved for a longer or shorter period, they have been more or less "fed out" by pasturing with stock; that is, much of the sod (particularly certain varieties of grass) has become killed out.

I began to improve my present farm (five miles from timber) when it had been pastured by scarcely anything except deer. The prairie sod was what might be called perfectly raw. I have broken the whole of it (960 acres), with the exception of a few small patches, in the past ten years. Have "broke" in all times of the year, and with different kinds of teams. The first breaking I did was in March and April, with three horses abreast on a fourteen-inch plow. I was well aware what was the effect of such early breaking, for I had been West seven years, but I wished "to be doing," and knew also that although it would cost me about as much to break it the second time as the first, it would at least break pretty easily in those two months. I continued breaking with the same team through May and June (the proper time for breaking to have the sod rot well), but it was too hard for three horses after the ground got hard.

I have broke muck prairie since with a fourteen inch plow and three large mules, which kind of a team can stand it clear through the breaking season, if pitched to the right kind of a plow and driven by a man of "gumption." Your "wooden man" will go along with such a team, letting one mule in the team pull his heart out, while another scarcely straightens his tugs, too lazy to fill his "shear" half as often as it should be; have his rolling cutter "yawing" either "to land" or else "across the sod," and set sometimes to run two inches deep and sometimes deeper than the share runs.

For mule breaking I have always used a twelve or fourteen-inch right handed plow, the mould board of which "lay well back," turning the furrow flat, instead of kinking up the sod as do those plows whose mould boards make a larger angle with the landside. Rig check lines on the outside pair mules, and fasten the inside mule by the bit to the hame or harness of the mule next to him. Put the best "stayin" mule in the furrow, and if the pair are inclined to crowd him over on the plowed ground, rig a "jockey-stick." Have your shares always sharp, and don't be afraid of your blacksmith bill. Always have two shares, and if a number of miles from the blacksmith shop, have three or four, so that you won't have to go to the shop so often. When you do go, get them all sharpened, of course. Rig your rolling cutter so that it is parallel with the land side. Frequently to make it so you will have to insert thin wooden wedges under one side or the other of the shank of your cutter previous to drawing the nuts tight with the wrench. A cutter needs watching, and frequently has to be straightened two or three times a day on account of getting twisted from striking a "red root," or from other causes. If your cutter "yaws" to one side or the other, it not only makes the plow run harder to the team, but also affects the running of the plow, makes it take too much or too little land. Rig a wooden wheel of about twelve to fourteen inches in diameter to run under your plow beam, by which to regulate the depth you wish to break. We used to make them by sawing inch thick boards into circular shape and then nailing three such thicknesses together with wrought nails clinched. (Right here, in parenthesis, let me observe that there is no use of buying wrought nails at two or three times the price of cut nails; good cut nails heated red hot and slowly cooled will clinch as well or better than the most of the wrought nails. In fact I find that such wrought nails, so called, as are sold these days are nothing but cut nails served in the way I speak of. By close examination one can see that they are only cut nails cut in the usual shape of wrought nails). But to get back from this digression. After making the wheel, put a wooden axle through it, take two pieces of common pine fencing, bore ⅜ round holes through your plow beam, about a foot or so back from your clevis; fasten your two boards, one on each side of your wheel, to the plow beam with bolts and nuts, and let the axle of your wheel run in them at the lower end. Have these boards of such length, of course, that the wheel will permit the plow to cut only such depth as you wish, in tough sod not over three inches, and the shallower the better.

Speaking of bolts, reminds me that I wish to make another little digression here, to say that I buy at the hardware store and "keep constantly on hand" lots of them, of two or three sizes, which come in play most frequently on a farm. The having them on hand has saved me many a seven mile trip to the blacksmith's shop.

To get back again, I would like to ask you, Mr. Editor, why our Western plow makers don't rig "horse breakers," with cast wheels of the sort described, under the beam, as our Eastern plow makers do under the beams of their sward plows? Perhaps Plant Bros., Pratt & Co., can tell; please ask them the first time you see them.

As compared with breaking tough prairie with large plows and ox-teams, the disadvantages of breaking with mule teams and small plows are: first, that one cannot make so good a job in breaking sloughs and flat places in the prairie, which are always much harder to break than upland prairie; second, that the small plows will nearly always "dodge" red roots, failing to cut them off, and leaving a "skelp" of sod unturned; third, it *is* pretty hard on a mule team, make the best of it, to break through the season. The advantages of a mule over an ox team are, that you have use for the mules in other ways besides breaking, whereas you might have to buy oxen for this special purpose. Your mules are right on hand in the morning, so that you have nothing to do but hitch up and go to work; while oxen, if you have to turn out on the range at night, are sure to be so far off in the morning, that it takes two or three hours to get them up and yoked. Your old prairie-breaking oxen are sharp; they will go as far as they can in the night, and will be sure to try and hide in the brush in the morning about the time they expect you along.

In many sections of country, *good ox drivers*—those who can drive *right*, and keep up a team of four yoke of oxen, keep them in good flesh and good spirits, make every ox pull his share, keep the yokes and bows right, and the cattle's necks from getting sore—are much scarcer than men who can drive three mules right. Men unaccustomed to the use of oxen may think "most any fool" can yoke up and "damn" four yoke of oxen along, but, let me tell you, there is a wide difference in ox-drivers. While one man will have his team down poor, and the tuck all taken out of them the first month, so that one would have to take sight by a pole to see that they move at all, the other's team will be in good flesh and spirits clear up to the end of the season. Your "no 'count" driver goes along side of his team, dreaming away, watching prairie chickens fly up, or whipping snakes with his whip—anything but attending to his business—until, on looking up, he finds that his lead oxen, perhaps, are away out on "the land" cropping grass, or his wheel oxen are hanging back in the yoke, and letting the rest pull them along, when he commences cracking them with his big whip, and "cussin'" till the crack of the whip and his "cusses" can be heard two miles. Seeing his blood is up, he turns in and gives the whole team "hail Columby" for a half "bout," and has them almost in a trot; about the time every ox has his tongue out lolling for want of wind, he subsides into the dreamy state. He is one of those drivers who are always boasting how they can "cut the red" out of a steer every time. By the time the season is over, his oxen have scarcely got a hair left on their rumps, the hide being perfectly calloused, and looking like an elephant's hide. A good ox driver has an eye for a yoke, and can tell, to the thickness of a shaving, whether it is shaped right for any particular yoke of oxen; he knows the proper "belly" to a bow to a dot; he rigs them right at the beginning of the season, and if they are not right, works away on them every day until he gets them so. He works his team easy in the commencement of breaking, and watches them close to "get acquainted," as he says, with every ox. After a few days, he discovers if they can be matched to better advantage than as they are at present yoked. He looks to the cattle's necks, and to the yokes and bows every time he hitches up. He don't go much on whipping, except a steer is refractory, under careful attention on his own part, when he gives him one or two sharp cuts, so that the steer knows exactly what he is getting whipped for. He walks up and down side of his team, from the wheelers to the leaders, with an eye on every ox; is one lagging a little, he touches him lightly with his whip; his leaders, nor any other yoke, ever get a chance to sprawl out on the land three or four feet from the furrow. He does not find any time to dream, nor to hunt for prairie chicken's nest; hand, and eye, and foot are constantly busy with his cattle. He ain't much on the swear, and as for hallooing, you could not hear him ten rods off. He takes pains to strike his lands off straight, so as not to be as long in breaking the last acre as in breaking any other two acres; he does not want his chains wearing holes in his cattle's legs, from so much short turning; he knows, too, that an hour or two's work in finishing up such crooked lands will worry a team more than a day's work in common breaking. When he goes to the shop with shares, he stands right over the smith to see that he sharpens them "well back;" says he don't want to file himself to death. He files his plow as often as necessary, keeping the same level on it the smith left, "not dubbing it off blunt," like your "no 'count" breaker.

He aims to keep his rolling cutter right all the time. When he crosses a slough, where the sod is inclined to fly back, he gets his team moving just exactly right as they approach it, then walks behind his plow and tramps the sod over. He takes pride in his team and work, and says: "Give me four good yoke of cattle, a Prairie or Bloomington twenty-inch plow, with a pasture to turn my cattle in nights, and some one to take my shares to the shop, and I will turn over one hundred and sixty acres of sod from the 15th of May to the 15th of July —with good luck and plenty of it—and not take fifty pounds of flesh off of nary steer."

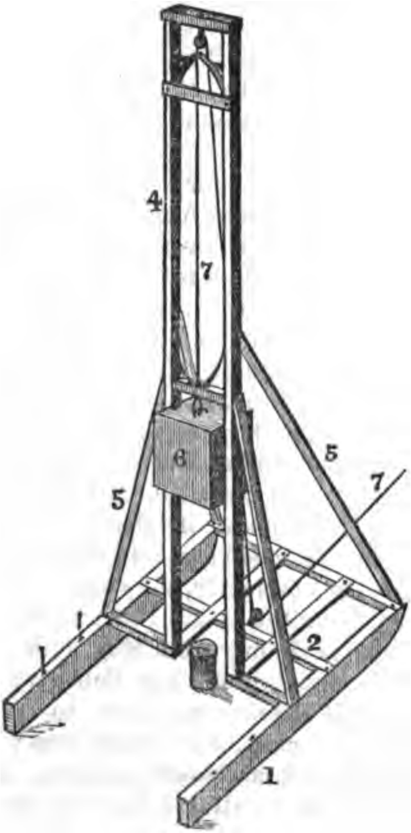
Well, to get back somewhere near where I commenced, that tough prairie of mine, broke in March and April, rotted but little, and grew up in grass so much as hardly to show that it had been broken at all. In the fall I plowed it with the same team, with a common old ground plow, with a rolling cutter on, across the sod, and it was nearly as hard breaking as in the spring. Then, too, not having rotted much, the last plowing was not much but cutting sods into square shape. I sowed it to winter wheat, wrestling the sods about with a harrow, yet after harvest it was still quite soddy, with many of the sods growing. The next spring I plowed it again, and tended it that season in corn, which used up the sods and brought it into fine tilth. I mentioned this to show the length of time, and the amount of labor, necessary to get early spring breaking, *of perfectly tough sod*, into good condition.

May and June are, pre-eminently, the months in which to break prairie, June breaking being the best. For a winter wheat crop, to be harrowed in on the sod, break only from May 15th through June. I have seen tough prairie trench-plowed in February and March, and sowed to spring wheat. If the season proves to be a tolerably wet one, it will make a very fair crop; but I have seen it, in a dry season, grow not over a foot in height, and make nothing. It is getting to be a very common practice, in Central Illinois, to trench-plow tough prairie for corn, commencing as soon as the frost is out of the ground as deep as the plows go. In this way early breaking is made to rot very well, and will make a good crop of corn if it rains enough.

In fall breaking, from September on till winter, the grass may frequently be killed, but the sod will remain as tough as leather, even tougher than early spring breaking. Breaking tough sod may be done from February on till the middle of July—by trench-plowing up to about the middle of May, and breaking sod only from that time on. I would not like to break in the fall even if trench-plowed.

So far, I have been treating altogether of breaking tough sod. Fed-out sod—such pieces of open prairie as we have here these days—can, much of it, be broke with a pair of horses; is not much harder to break than a blue-grass sod. After the first year or two, my sheep reduced the cost of my breaking very much. Sheep kill a prairie out much faster than other kinds of stock, from biting closer.

POST DRIVER.



The above is a fair representation of a very useful implement for fencing prairie farms. On a visit to a newly opened sheep farm in

Montgomery county, last spring, where four and a half miles of board fence had just been completed, I noticed and sketched this post driver, which is constructed on the principle of the common pile driver.

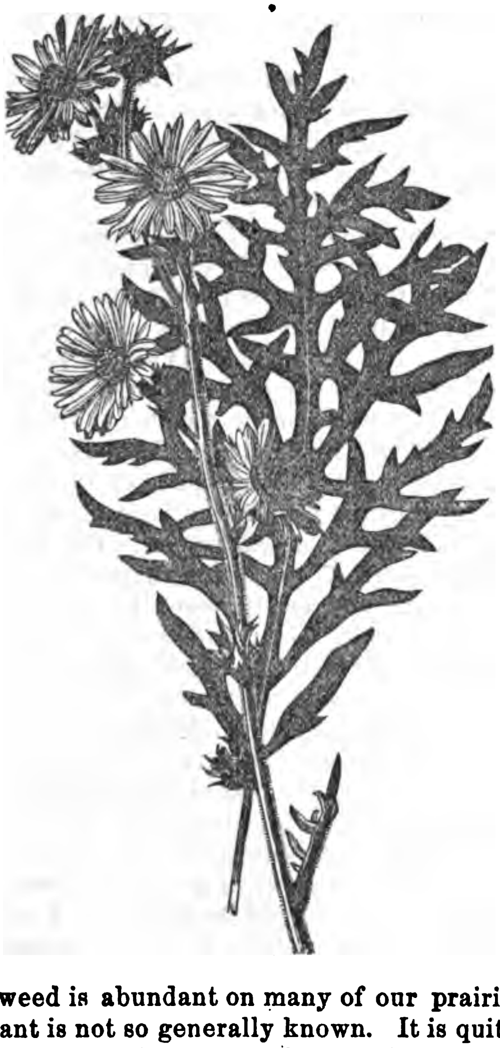
Such a machine has been in use for some years in some localities, but is thought to be rather new in this State. It answers the purpose most admirably, and may be constructed by any farmer of ordinary ingenuity, with the exception of a little blacksmith work, the pulleys and rope.

The pair of runners (1) are 9 feet long, made of oak, 7 inches wide and 4 inches thick. The cross pieces (2) are of 4 by 4-inch scantling. The distance from the rear cross piece to the next one is 10 inches, and from that to the front one is 2½ feet. The rear one is left open in middle, as represented, for the post. Two pieces of 2 by 4-inch scantling are bolted across the top of the cross pieces near the middle, as seen in the cut. The two upright pieces (4) are 20 feet long, 2 by 6-inch scantling, stiffened by a 2 by 4-inch piece spiked on the outsides, edgewise. They would be better made of 4 by 6 inch stuff, or even 6-inch square, as they are required to be stiff. The braces (5) are 2 by 4-inch, the front ones a foot the longest. The weight, or block (6), may be round or square, 20 inches in diameter, and 2 feet or 2½ feet long, of solid, heavy oak, and grooved in the sides next to the uprights. In the top of this is a strong staple, to which the shears, which are fastened in the sliding block above, catch. The grooves in the weight are 6 inches wide, to take in the whole width of the uprights. (Four pins on each side would answer the purpose of grooves). Two 2-inch auger holes are bored through the rear portion of each runner, in order to drive in stakes or a crowbar to keep the machine from being drawn forward while driving the post. A pin through one of the uprights will hold the weight up, when not in use, to the proper height to be out of the way of placing the post.

The working will be readily understood. A chain is fastened to the front cross piece at the points where the top pieces are joined, to which the whiffletrees are hooked. It is then drawn forward by a span of horses or mules until the weight is over the mark for the post. The post being placed, the whiffletrees are then unhooked from the chain and hooked to the rope which pulls up the weight. One to three blows will drive the post in to the required depth. It is then drawn forward to the next post.

Two men and a span of mules will drive three-fourths of a mile of posts in a day, and one man will mark for the posts and face them ready for the boards in the same time. The posts are slightly pointed and thus driven, are very firm. The whole cost of such an implement is about $25, and it will pay for itself in a few days.

SILPHIUM LACINIATUM—THE COMPASS PLANT, OR ROSIN WEED.



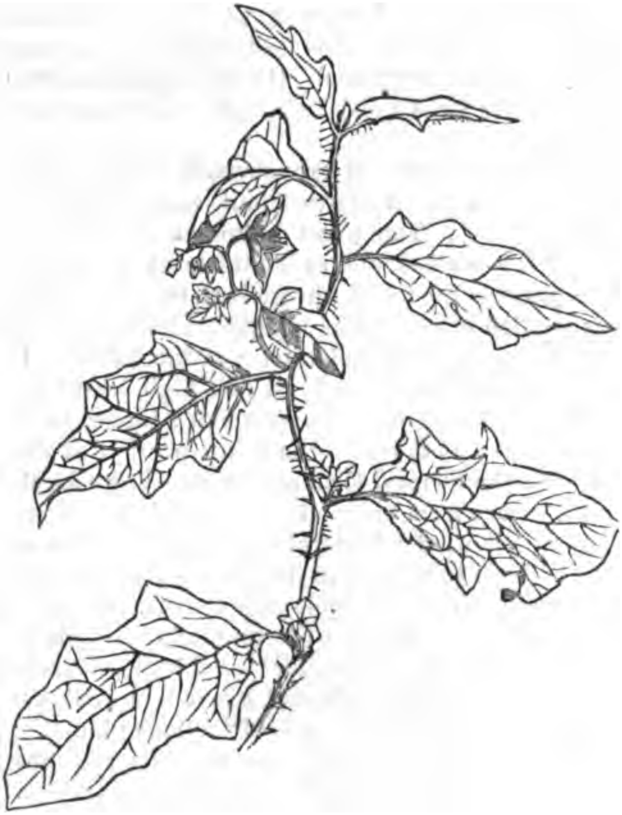
The rosin weed is abundant on many of our prairies. The name of Compass Plant is not so generally known. It is quite true that the general direction of the leaves, on the prairies, is north and south, that is, the edges of the nearly erect leaves are to the north and south. Some of the leaves vary from this rule, especially where they are crowded. It is said that men have frequently been guided in their course by this plant when traveling on the broad prairies, in the absence of other land-marks or the sun. Some botanist (we do not recollect his name) has claimed the honor of first making known this peculiarity of the rosin weed, but the probability is that he first learned it from some frontiersman.

The rosin weed is a sign of good soil on the prairies, just as much as black walnut is a sign of good land in timber.

It grows to the hight of five or six feet. The cut shows a single leaf—they are generally about two feet in length—and the top of the stalk flowering. It abounds on rich, wild prairie soil throughout the West, but is rarely seen in cultivated fields. It is sometimes found in open places on timbered land. Our cut first appeared in the *American Agriculturist* for August 1868, and the following is what was then said of it:

"In looking over a recent French work upon floriculture, we were surprised to see one of our prairie plants introduced as desirable for ornamental purposes. The plant is known in the West as the Compass plant, or Rosin-weed, and to botanists as *Silphium laciniatum.* The first, or generic name, is an ancient Greek one of some plant, which was applied to ours by Linnæus; while the specific name—*laciniatum*—describes the cut character of the leaves. It is a strong-growing perennial, from three to six feet high, bearing at its summit several rather coarse yellow flowers about 2 inches in diameter. The root leaves, as well as those on the lower portion of the stem, stand erect, and have the general form of the one shown in the engraving. The root leaves are from one foot to two and a feet in length, and, with the whole plant, of a dull yellowish green. The only claim that this plant can have to a place in the garden must be found in its rather striking, though coarse and inelegant leaves. In the present rage for plants with ornamental or grotesque foliage—" phyllomania," as it has been called—we do not wonder that this *Silphium* has been taken up. Burdock, if it were rare, would exceed in real beauty some of these highly prized and highly priced " foliage plants." The common name, Rosin-weed, is given it on account of its resinous juice, which often exudes and hardens upon the stems and leaves in the form of small yellowish tears. The term Compass-plant is from the alleged fact that the edges of the leaves point north and south. This has given it other names of similar import, such as Polar-plant, Pilot-plant, etc. The statements with regard to the polarity of the leaves have given rise to discussions, both here and abroad. As we have seen the plant in gardens, its leaves " knew no south, no north, no east, no west," but quite " boxed the compass; still, evidence goes to show that upon the open prairies the direction of the leaves is so generally towards north and south as to warrant the popular name. The plant is found in Michigan and Wisconsin, and southward and westward. There are five other species found east of the Mississippi, some of which have been cultivated in the garden."

HORSE NETTLE—(*Solanum Carolinense.*)

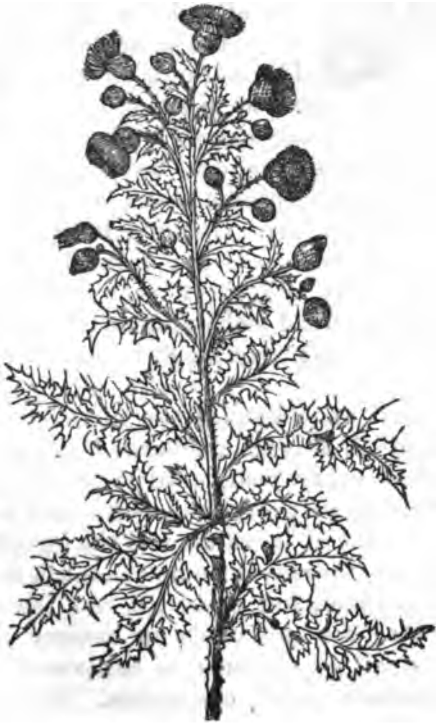


Darlington, in "Weeds and Useful Plants," says: "This is an exceedingly pernicious weed, and so tenacious of life that it is almost impossible to get rid of it when once fully introduced. It grows in patches so thickly as to deter stock from feeding among it, and even to monopolize the soil, while its roots gradually extend around and to a great depth. It is a native of the Southern States, but has found its way to several localities in Pennsylvania. The farmers will do well, therefore, to enable themselves to know it when they meet it, and moreover, to eradicate it promptly and effectually wherever they find it on their premises."

Gray's description of this plant is as follows: "Perennial; low (one foot high); stem erect, prickly; leaves ovate oblong, acute, sinuate-toothed or angled, roughish, with stellate pubescence, prickly along the midrib, also the calyx; flowers (pale blue or white, large) in simple loose racemes; berries globular, orange yellow: sandy soil; Connecticut to Illinois, and southward."

It is in blossom from June to August, and flourishes without difficulty here on stiff clay soil, growing to the height of one and a half to two feet. The berries are from one-third to two-thirds of an inch in diameter. When the root is cut below the surface of the ground it sends up two or three sprouts, and will continue to do this all summer. It increases rapidly, and is becoming a serious evil in some localities within our State, and farmers are admonished to take pains to check its increase before it becomes more serious. It is believed that the most effectual, if not the only feasible mode of eradicating it where it has become well established, is to kill it by a free application of salt or gas lime. The latter may be obtained at the gasworks for about the cost of barreling.

THE CANADA THISTLE.—(*Cirsium Arvense.*)



The Illinois Legislature has passed a law providing that any person bringing into the State seed of the Canada thistle, in the packing of goods, grain or grass seeds, or otherwise, and permitting the same to be disseminated and vegetate, shall be liable to a fine of $400; and any person allowing this thistle to mature and disseminate its seed upon his lands shall be subject to a fine of $75.

Every western State ought to enact a similar law, and then farmers should see that it is enforced. One who has never had experience with this intolerable pest can scarcely conceive the magnitude of the evil. It is one of the worst weeds that can infest the farm. They will take entire possession of the ground, and nothing will eat them or feed among them. It is almost impossible to bind grain that contains them. They spread rapidly by the roots, and extensively by the seeds, which with their feathery appendages, are blown about by the winds.

Comparatively few western men know this thistle when they see it. It may be found in places along the railroads, and occasionally near farm buildings. It may be checked with comparative ease, if recognized and taken in time. Apply the salt, old brine will do, or gas lime, or carbolic acid.

One of the editors of the *American Agriculturist* having had an opportunity to observe the spread of this evil in the West, wrote as follows:

"In our recent travels to attend the State Fairs, we noticed almost every where in the West the steady advance of this scourge. The West once had clean fields; but now, in many sections, the pastures and meadows are as foul as in the oldest parts of the country. Most of the older railroads are already well stocked with the Canada thistle at their northern extremities, and every year carries them further south. The seed is furnished with a tuft of down, which makes it float in the air like a feather. Growing in close proximity to the railroad track, these winged seeds are drawn into the current of air made by the passing trains, and every year distributed more widely over the country. The railroad embankment becomes thickly stocked with them, and from this line they are distributed over all the adjoining fields.

This is a great evil, and demands the immediate attention of all our State legislatures. If it is left unchecked, the thistles will spread over a wider territory every year, until they take possession of the whole country. The cost of every crop cultivated will be increased, pastures will be diminished in value, and the quality of hay will be depreciated. It is true, there is some nutriment in thistles, and asses are said to be fond of them, but these are not the wisest of beasts; and if they were, they are not likely to become popular stock in America. It is an unmitigated curse in cultivated fields, increasing the cost of farm produce to all consumers. More Canada thistles means dearer corn, wheat, rye, oats, and potatoes. They increase the cost of living to every man in the country. Railroads are a great blessing, but they have no right to spread this pestilence over our fields.

Legislation is needed to compel the railroads to keep their tracks clean. The State Commissioners, which have the oversight of these institutions, should be instructed to see that this pest is kept under. If there were frequent mowings, to prevent the seeding of the plant, it would soon disappear from the tracks. And while the legislatures are considering the case of the railroads, they may as well take in hand those slovenly farmers who allow these weeds to overspread their fields without hinderance. What right has a man to make his farm a seed bed of Canada thistles? What right has he to make himself a nuisance among his neighbors? The harboring of this pest should subject the farmer to fines and penalties. We must have legislation, or Canada thistles will possess the land."

APPLE REPORT FROM JOHN P. McCARTNEY, OF CAMERON MISSOURI.

At your request I have made out the following table of varieties of apples that I have tested here for from ten to twenty-five years. It is made out on a scale of ten, and as ten years is too short a time to test the productiveness of many varieties, some of them that I have only cultivated for that length of time I leave blank in the productive column. I have also more or less younger trees in orchard of Keswick Codlin, Duchess of Oldenburg, Trenton Early, Buckingham, H. Nonsuch, White Pippin, Minkler, Peck's Pleasant, Baldwin, Rome Beauty, and Winter Wine, that are all so far quite promising. Orchard on the prairie; timber on the West:

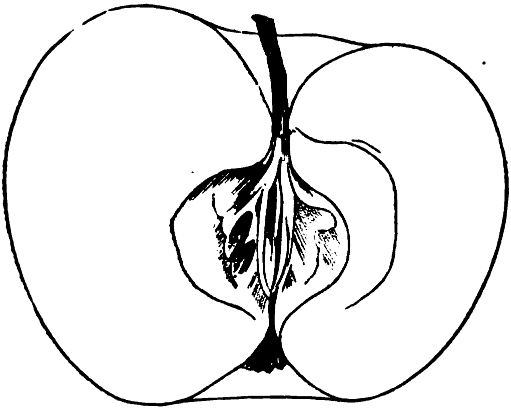
SUMMER APPLES.

VARIETIES.	Flavor.	Hardiness.	Thrifty Growth.	Early Bearing.	Productiveness.
A. S. Pearmain	10	9	4	9	8
Benoni	8	10	8	5	8
Buffington's Early	9	9	9	3	4
Carolina June	8	10	7	8	9
Early Harvest	8	8	8	4	8
Early Red	6	10	9	7	9
Early Pennock	8	10	9	10	8
Horse Apple	3	8	9	8	9
Hocking	9	10	8	9	10
Red Astrachan	8	10	9	6	—
Sweet June	10	10	10	10	10
FALL APPLES.					
Autumn Swaar (acid)	7	9	8	5	—
Belmont	9	4	7	6	6
Fall Pippin	8	6	9	6	8
Fall Wine	10	9	8	10	9
Fall Orange	7	10	10	3	—
Fall Jeneton	6	10	10	5	—
Fall Queen	9	8	8	10	—

APPLE REPORT FROM JOHN P. McCARTNEY—CONTINUED.

VARIETIES.	Flavor.	Hardiness.	Thrifty Growth.	Early Bearing.	Productiveness.
FALL APPLES—Continued.					
Fameuse	9	10	8	8	10
Fulton Strawberry	8	10	8	8	7
King of Tompkins Co	8	10	9	6	4
Gravenstein	9	10	8	6	—
Green Sweet	8	9	8	8	9
Jersey Sweet	8	10	6	8	8
Late Strawberry	9	9	8	4	—
Lowell	9	9	8	9	9
Ladies Fancy	4	10	9	8	10
Maiden's Blush	6	3	7	8	8
Porter	9	10	8	8	—
Rambo	10	4	10	6	9
Westfield Seeknofurther	8	8	8	4	—
Vandever Pippin	4	6	8	8	5
WINTER APPLES.					
Ben Davis	6	10	8	10	10
Domine	8	10	10	10	10
Esopus Spitzenburg	9	1	5	3	6
Fallawater	6	6	10	9	9
Fulton	10	8	8	4	—
English Golden Russet	6	10	9	4	—
Jonathan	10	10	4	10	10
Limbertwig	5	10	8	10	10
Ladies Sweet	9	8	3	4	—
Milam	6	9	6	8	10
Northern Spy	6	10	10	1	1
Newtown Pippin	9	2	4	2	—
Pennock	4	10	9	6	9
Pryor's Red	10	9	4	2	—
Ortley	10	8	9	8	10
Roxbury Russet	4	8	8	8	—
Raule's Janet	9	9	8	6	10
Romanite	6	10	9	10	10
Romanstem	9	9	9	8	8
R. I. Greening	9	8	8	8	6
Sweet Nonsuch	8	10	9	6	8
Talman Sweet	5	10	10	8	—
Vandevere	9	9	8	5	—
White Pearmain	10	10	10	8	10
Winesap	9	10	8	10	10
Willow Twig	5	10	9	9	10
Yellow Belleflower	10	10	8	2	2

NEW FRUITS.



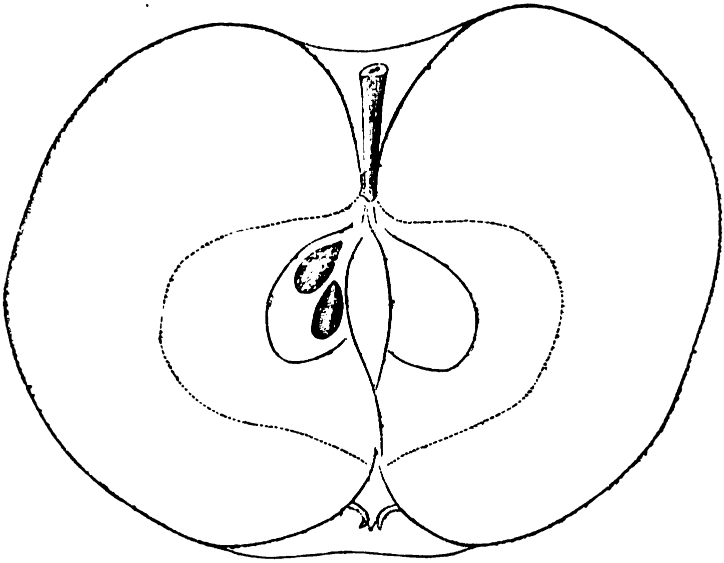
INGRAM'S SEEDLING.

"Habit of tree, much like Raule's Janet."

Fruit—Size, medium or below; form roundish, oblate; color, dull dark and light red in broken stripes, with a bluish or mouldy shade near the stem, many gray dots (near the calyx they are quite abundant and irregularly formed), a few black dots; stem, medium size and length; cavity deep and open, regular; calyx with short divided half-closed segments; basin, broad, deep, slightly furrowed; flesh, yellowish white, aromatic, breaking, crisp, mild sub-acid, good; core, compact; seeds, abundant, irregular, long, pointed, almost black; season, March to June.

The above description of the fruit was made by F. R. Elliott, author of the Western Fruit Book, to whom the specimen was submitted. The cut was made from a single specimen, received in the early part of May, from Mr. D. S. Holman, Secretary of the Greene County (Mo.) Horticultural Society. It was called Ingram's Seedling, but it is much better to omit the "Seedling" and establish a short name.

A short time afterwards, Mr. Holman sent two or three more specimens of the Ingram; one of them considerably larger than the one from which the cut was made, and showing the calyx more perfect, open, with the segments long and reflexed. Mr. Holman wrote that "the originator of this apple, Martin Ingram, is an old and esteemed citizen of Greene county, near Springfield; a farmer. I met him in town last Saturday, and obtained from him the following statement, with a few good specimens of the apple, two of which I send you for further examination. Mr. I. KNOWS it to be a seedling from Raule's Janet. The tree is a strong grower; rather upright; perfectly hardy; uniform, regular bearer; fruit-buds have never killed by frost; blooms one week earlier than its parent; never drops its fruit; long keeper (his family use them in May and June, when other apples are gone); has kept them thus with no special care in a damp cellar; thinks with care he will be able to exhibit a few sound specimens at our Society meeting in July. Its crispness and aroma are retained to the very latest of its season, neither being injured by other apples rotting in the bulk."



MISSOURI SUPERIOR.

Missouri Superior (*Syn. Large Striped Pearmain?*)—Specimens exhibited at the Illinois Horticultural Society, at Bunker Hill, December 15, 1868, by A. M. Lawver, from near Kansas City. This appears to be a favorite in Missouri. The committee declared it to be very like the Large Striped Pearmain, of Kentucky, and supposed it the same.

Fruit globular, sometimes oblate, regular, very large and handsome. Surface smooth, yellow, covered with mixed red, and splashed or striped carmine, the whole so mixed and tempered as to appear gray; dots numerous, small, yellow, indented.

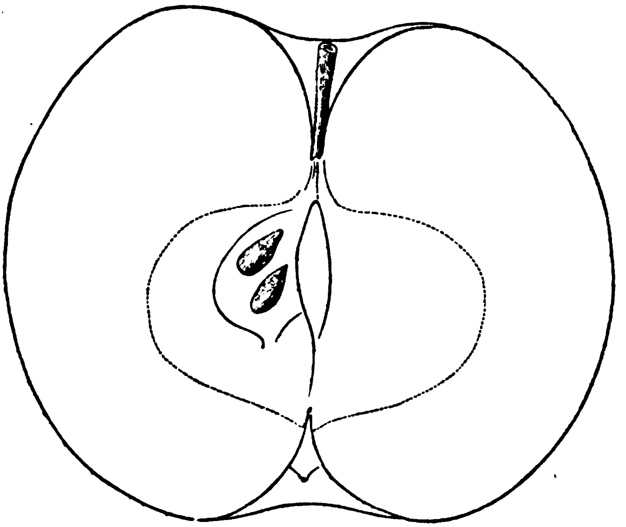
Basin shallow, wavy; eye long, medium, closed.

Cavity acute, deep, wavy and brown; stem medium or short.

Core wide, open, regular, meeting; capsules large; seeds numerous, long, dark; flesh yellow, breaking, juicy; flavor sub-acid; use market, kitchen and perhaps table; quality, from good to very good perhaps; season December to February.

It is probably only a form of *Large Striped Pearmain.*

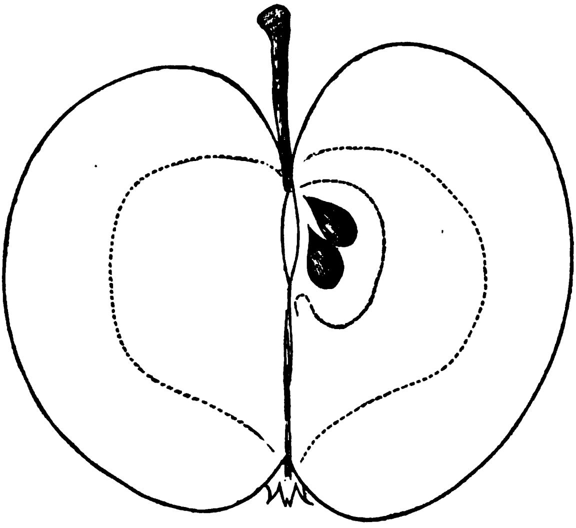
DR. J. A. WARDER.



PARK'S KEEPER.

Park's Keeper.—The history of this apple is, that it was grown from seed, probably of the preceding variety, which it much resembles, but from which it differs, as we are informed by Mr. Lawver, in the tree growth.

Fruit large, globular, or oblate; regular; surface smooth, yellow,



THE MAXEY.

covered with mixed red, splashed with carmine, and with a gray shading; dots rather numerous, small, yellow.

Basin shallow, regular; eye small, closed, long; calyx reflexed.

Cavity acute, deep, wavy and brown; stem medium.

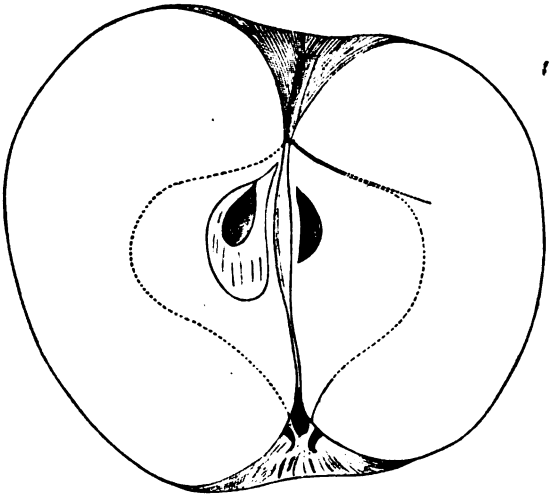
Core medium, regular, open clasping the eye; capsules large; seeds numerous, long, pointed; flesh very yellow, breaking, firm, juicy; flavor sub-acid, aromatic; uses, market and kitchen; quality quite good; season December to March, or longer.

DR. J. A. WARDER.

The Maxey.—This is a new variety and its origin not yet determined. The tree is said to be a good grower, an annual, but not an early bearer.

The fruit always fair, and even, regular size, and keeping sound and good into May or July. From specimens before us we make the following description: Fruit medium or above; roundish, approaching conical; light, pale greenish ground, with broken stripes and splashes from the stem; end of pinkish red; light dots and distinct dark specks; stalks of medium length and size; cavity regular; round, smooth, lightly russeted; calyx large, open, with divided recurved segments; basin shallow, broad, regular; flesh whitish; not very juicy or tender; mild, sub-acid, good to very good; core small; seeds blackish. Season, May to July.

F. R. ELLIOTT.



METCALF.

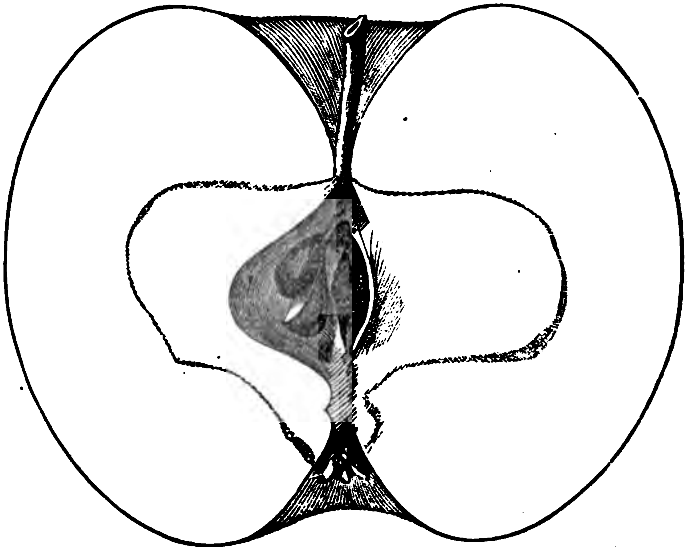
This is a seedling which originated with William Metcalf, Esq., a nurseryman living three miles from Trenton, Grundy county, Mo. It is an apple of considerable merit, evidently a good keeper, and of good quality. I have not been able to learn the habit of the tree. The cut was made from the smallest of two specimens sent. It is about the size of the Jeneton and is much like it in form. As seedlings of good quality originating in the State have generally proved valuable, being well suited to the climate, this is probably well worth propagating.

Fruit medium in size, slightly conical, often largest on one side; surface slightly rough, yellow, mostly covered with red, slightly streaked and splashed, with gray shading; dots few dark brown.

Basin shallow, crimped; eye medium, open, calyx reflexed.

Cavity acute, deep, brown next the stem, stem short.

Core small, regular, capsules medium, reniform; seeds medium, pointed; flesh yellow, breaking, firm, juicy; flavor sub-acid, slightly aromatic; quality good; season probably January to April or longer.



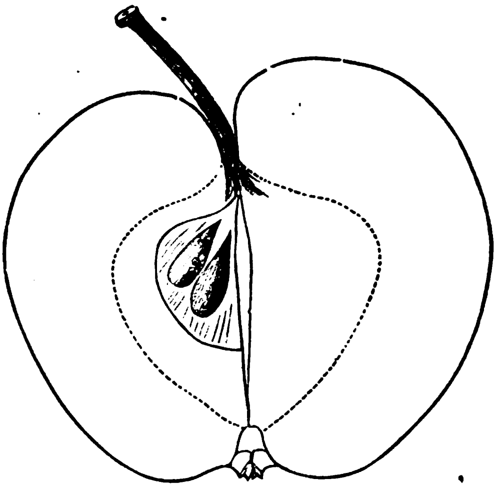
THE LAWVER APPLE.

This apple originated with Mr. George S. Park, of Parkville, Platte county, Mo. The following is Mr. Park's account of it:

"We got a large apple—I think called the Missouri Superior—in the spring, some fifteen years ago. My wife suggested that we plant the seed, which was accordingly done, beside a stump near the house. One of these seedlings, the one now under consideration, bore, I think in five years, from the seed. For the last four or five years it has done well every year, every other year a little fuller. The fruit hangs on well, does not rot, speck, nor scab; it is smooth, and picks well.

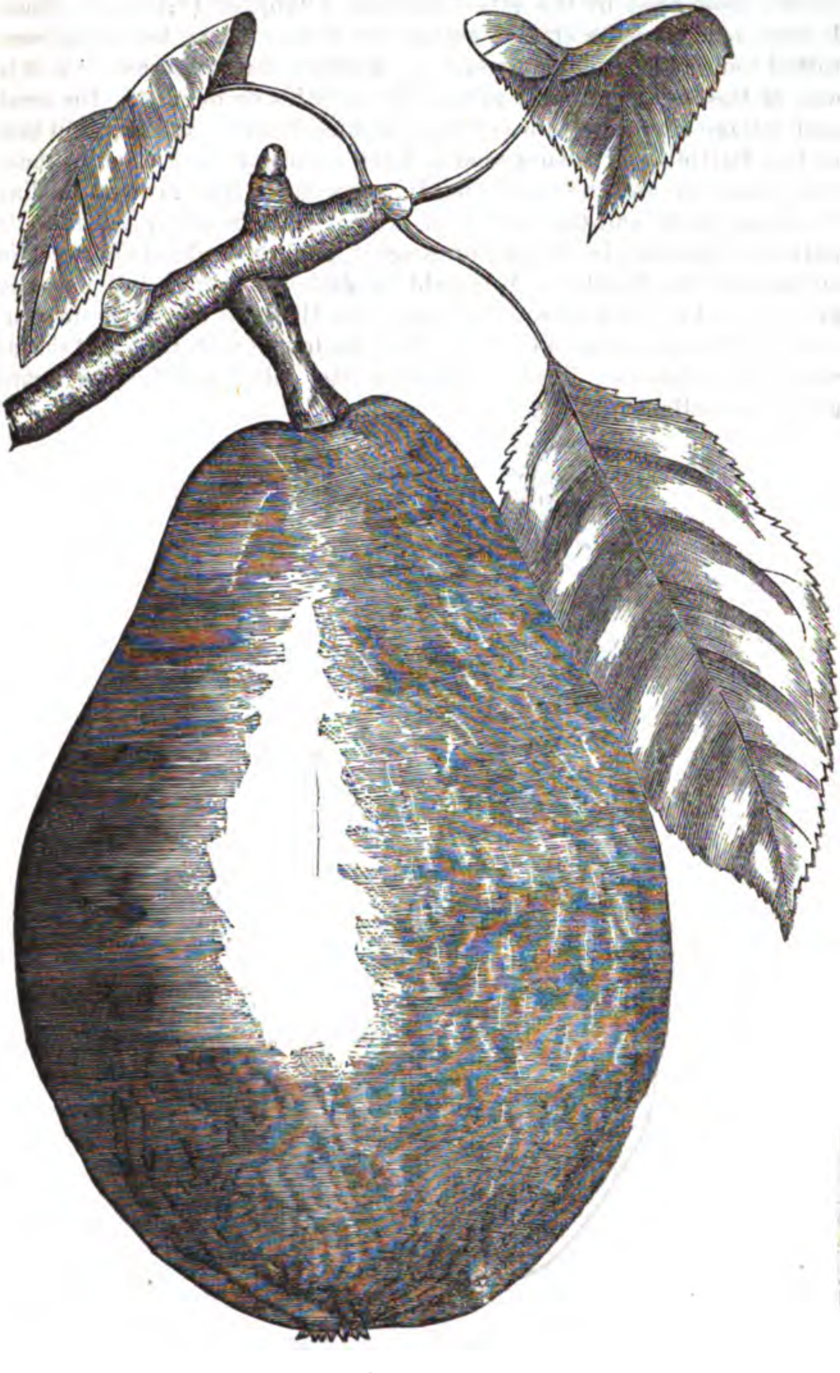
"Tree a thrifty grower, smooth, healthy bark, greenish brown. It has a spreading habit, makes a fine head; altogether a fine type of an apple tree. The apple keeps until June or July. I sold them last May (1867) for $2 to $4 per bushel, and they retailed at ten cents each in Kansas City. The leaf is a rich green, finely serrated dark, bright red color. Fruit bright, dark red, thickly covered with small dots; surface smooth; size medium to large; basin shallow, slightly ribbed; calyx small and closed; cavity abrupt, deep, slightly greenish russet, nearly smooth; stem small, medium length; core closed; flesh firm, white, crisp, sprightly, lively, aromatic, mild acid; quality *very good to best* for market, table and kitchen; keeps well; core wide, and seeds numerous, plump, light olive brown. Boys say they have never kept them longer than May, but thought they would keep until July. The tree had been broken down when small, had recovered, and then split down at the forks from weight of fruit. It has now put out a fine, strong, spreading head, and looks in fine condition. It promises to be to the West what the Baldwin is to the East, just the thing for commercial orchardists to ship North and Northwest, and for "train boys" on railroads, in spring. It is an early and constant bearer, and escapes spring frosts.

PARKVILLE, MO. GEO. S. PARK.



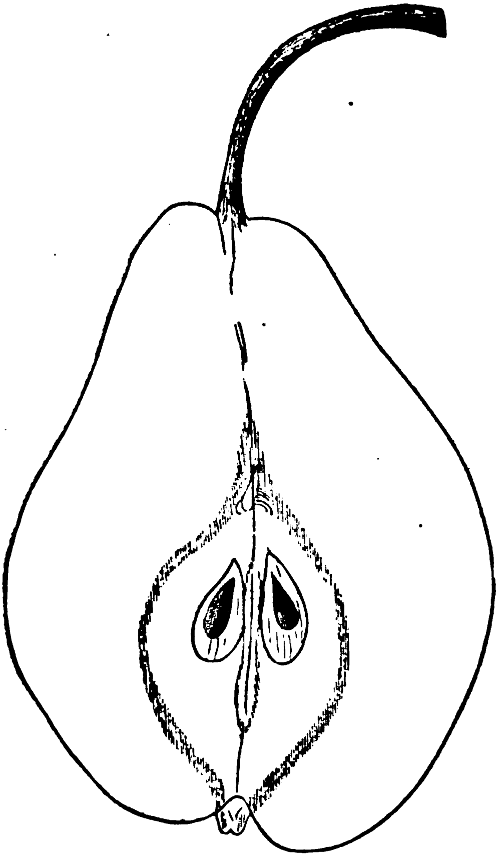
MANNINGTON PEARMAIN.

This is a dessert apple that originated in Sussex, England, and is there held in considerable esteem. It has fruited several times in this country, and fully sustains the character of a very superior table apple. The tree seems hardy, and is an early and productive bearer. The fruit is rather below medium size, roundish conical, truncated, light yellow ground, partially russeted, shaded, and splashed with clear red, and dotted with many prominent, rough, light russet grey dots. Stalk long, rather slender; cavity narrow, regular; calyx, nearly or quite closed: basin shallow, slightly wrinkled; flesh yellowish, crisp, tender, spicy, sprightly, aromatic, brisk sub-acid; very good; core medium; seed large, long. Season, December to February. From specimens examined by us, it is highly worthy the notice of, and a trial by, our Western fruit growers. F. R. ELLIOTT.



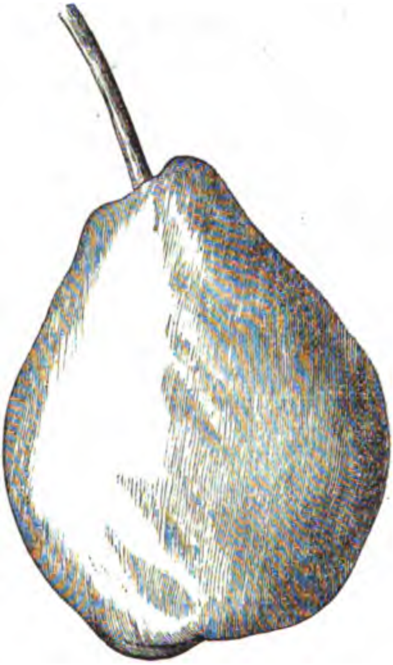
CLAPP'S FAVORITE.

Clapp's Favorite.—This fine pear is of American origin, and was grown from seed by the late Thaddeus Clapp, of Dorchester, Mass. It must, of course, be classed among the newer pears, but it has been tested long and carefully enough to warrant the statement that it is one of the finest and most promising varieties on our list. The wood and foliage resemble those of the Flemish Beauty, and the fruit that of the Bartlett. It is supposed to have sprung from a cross of those two varieties, and the tree is hardy, vigorous, a fine grower, holding its foliage well, and the fruit is of large size, fair and plentiful. Its period of ripening is the last of August, generally about one week in advance of the Bartlett. It should be gathered before full maturity and ripened in the house. The surface of the fruit is a little uneven; color, yellowish-green, becoming clear yellow at maturity, and shaded with red in the sun. Flesh greenish-white, juicy, melting, perfumed and of excellent quality.



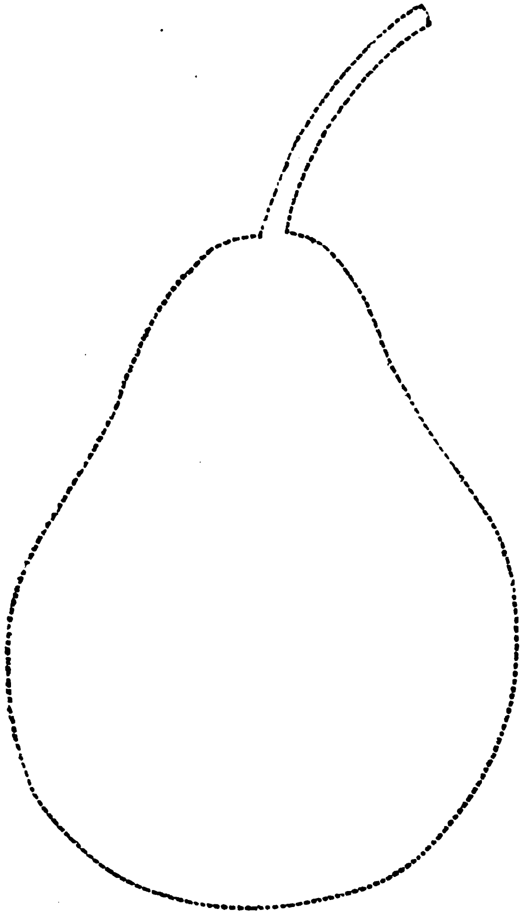
SOUVENIR D'ESPERIN.

This is one of the superior new pears. It should be tested by every pear grower. Fruit medium size; oblong, ovate pyriform; yellow ground, overspead with a slightly rough, dull cinnamon russet; stem long, slender; set with little or no depression; calyx partially open, with short erect segments; flesh whitish, juicy, melting, with a rich, spicy aromatic] flavor; very good to best; core small, with a hard gritty line surrounding; seeds dark brown, plump and full. Early November.



Our shaded figure and small outline give the pear in its smallest size, while the large outline shows its size when well grown. Both have been made from the fruits before us.

F. R. ELLIOT.



DELICES DE LA CAUCADIERE.

Fruit large, regular, oblong, ovate, pyriform; skin greenish yellow, marbled and shaded with browish red on sunny side, and with many light dots; stalk long, set without depression; flesh white, fine, melting, juicy, sweet, with an agreeable aroma; very good, or best. Last of July or early in August. This is a new French pear, which took a premium in 1846. It is little known in this country, our knowledge thus far only being in possession of a few amateurs. Its size and time of ripening, however, are such as to induce a careful noting of it, and a testing, because ot its promising value.

F. R. ELLIOTT.

THE WILD GOOSE PLUM.

This invaluable fruit was first made known to the public about twenty years ago by Capt. Means, of Middle Tennessee, who, having killed a wild goose, discovered a plum seed in it which he planted, out of curiosity. It grew rapidly, and fruited the third year; and being convinced of its superior qualities he made it known to various nurserymen, who, from this same, propagated all the genuine Wild Goose plums that are now so deservedly popular wherever known.—This plum is undoubtedly a seedling of the Chickasaw, but so much superior to it in size, quality, firmness, adaptability to shipping long distances, and its immense productiveness, as well as its early bearing, rapid growth, and long duration, as to fully entitle it to a distinct appellation.

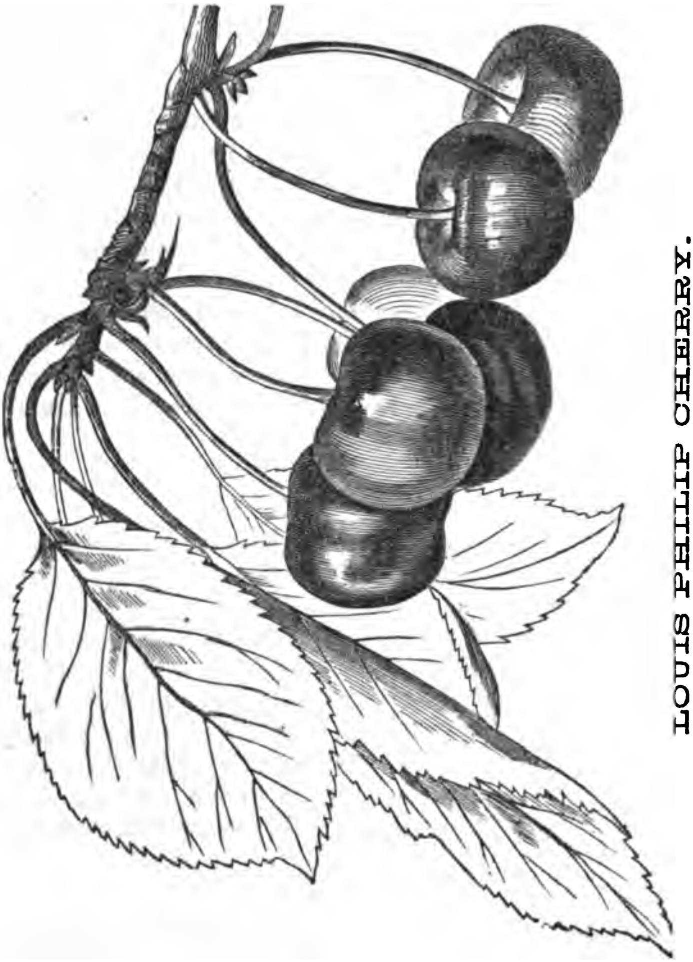
The fruit is quite large, averaging from three to three and a half inches in circumference. It is very solid and firm, admits of rough handling, bears marketing admirably, and if gathered when almost green will ripen nearly as well as if left on the tree—thus enabling the grower to send it hundred of miles for sale, and when exhibited to have the satisfaction of seeing it in perfect condition, well matured, and almost as fresh as when first plucked. The tree is as hardy as the wild plum, and grows as rapidly as the common peach, and attains as large a size, and is longer lived. The trees are not so thorny or bushy as the common plum, but grow more open, with longer limbs, like the peach. The growth is so rapid as to often reach from six to eigth feet in one season, from the bud or graft.

PROPAGATION.

It is very readily propagated from suckers by grafting on the peach or common plum, or by budding. It grows on the peach as fast as the stock, and is then free from plum suckers, so injurious to the tree and annoying to the nurseryman. It will grow free from suckers if planted very deep, and it is then less subject to the attacks of the borer. *The little Turk* or *curculio*, the enemy of all other plums, *does not injure the fruit.* It will not reproduce itself from the seed, though it might be advisable to plant them to try the chances of finally obtaining one superior to the present. The trees should be planted out when one year old, twenty feet each way.

PRODUCTIVENESS.

It bears such immense crops as to frequently break the limbs by the weight of the fruit, unless thinned, or securely propped, yielding from one to five bushels per tree. It blooms about the same as the peach generally; it begins to ripen in this latitude about the 15th of June, and continues to the last of July. For productiveness it should be classed with the Concord grape of the North, and the great Scuppernong of the South, *the two grapes for the millions*, especially the latter, which yields twice as many grapes to the vine or acre, as any other on this continent, and never fails. This king of plums might be termed the great National Plum with as much propriety as the



LOUIS PHILIP CHERRY.

Wilson's Albany is called the National Strawberry—should it prove as productive in the North as it has in the South.

PROFITS.

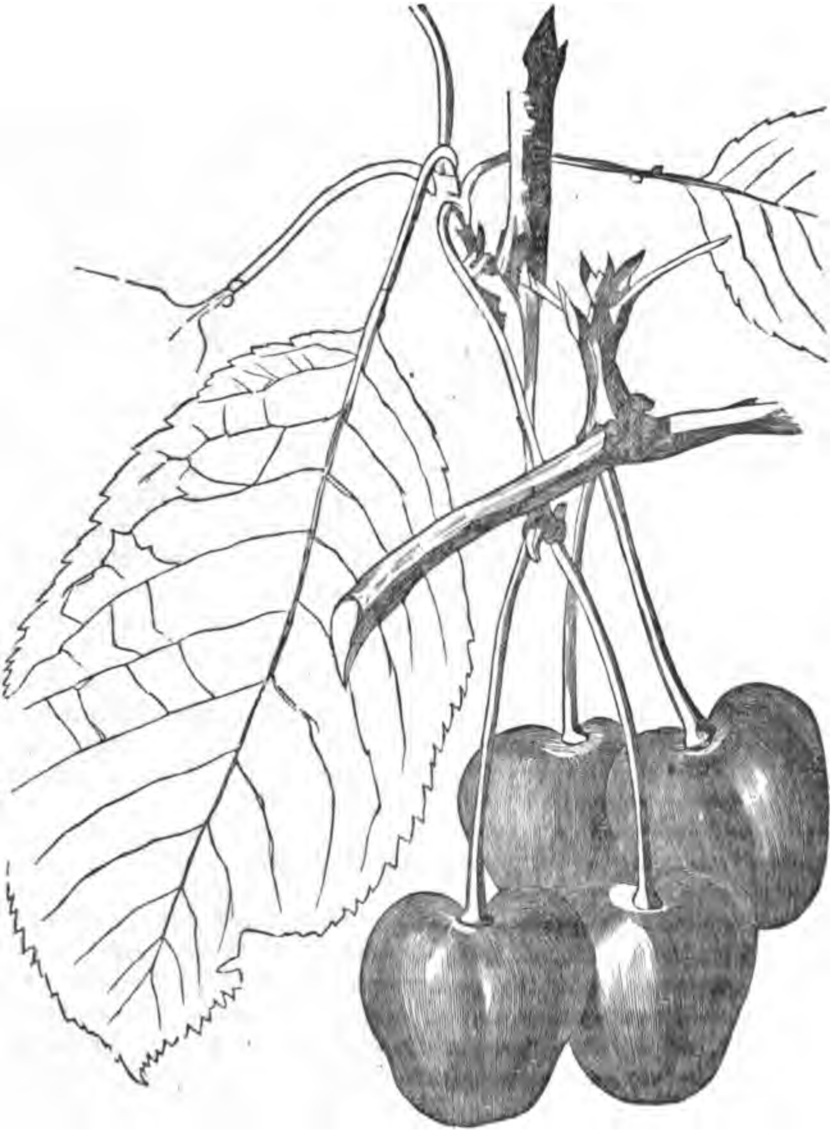
It commands very readily in market, where offered, from $5 to $10 per bushel, and is much used for dessert, jellies, pies, puddings, preserves and for canning. One hundred and nine trees will plant an acre; can be had for $40 to $50; will begin to bear the second year, continue for 20 years, from one to five bushels per tree, worth at least $5, averaging $10 per tree, or $1,000 per acre—being more than twenty times as profitable as corn, cotton or tobacco. Every man, woman or child who owns a rod of land should plant the Wild Goose plum. It will richly repay both them and their posterity.

Iuka, Miss. J. M. D. MILLER.

Dr. M. W. Phillips, editor of the *Southern Farmer*, says: This plum, without doubt, stands at the head of the plum family, and for marketing purposes it has no equal. It is said to have been found in bearing on White Creek, near Nashville, Tenn., in a bottom where, three years before, a flock of wild geese were known to have spent the night. It is an abundant bearer, full-grown trees yielding a full barrel; very large, and, when properly thinned, growing to the size of "pullet's eggs;" beautifully mottled, sugary, and melting. They readily bring $12 per bushel in Nashville, Memphis, and New Orleans markets. They require to be picked twenty-four hours before eating; and will bear forty-eight hours transportation and reach the market in fine eating order.

LOUIS PHILIP CHERRY.

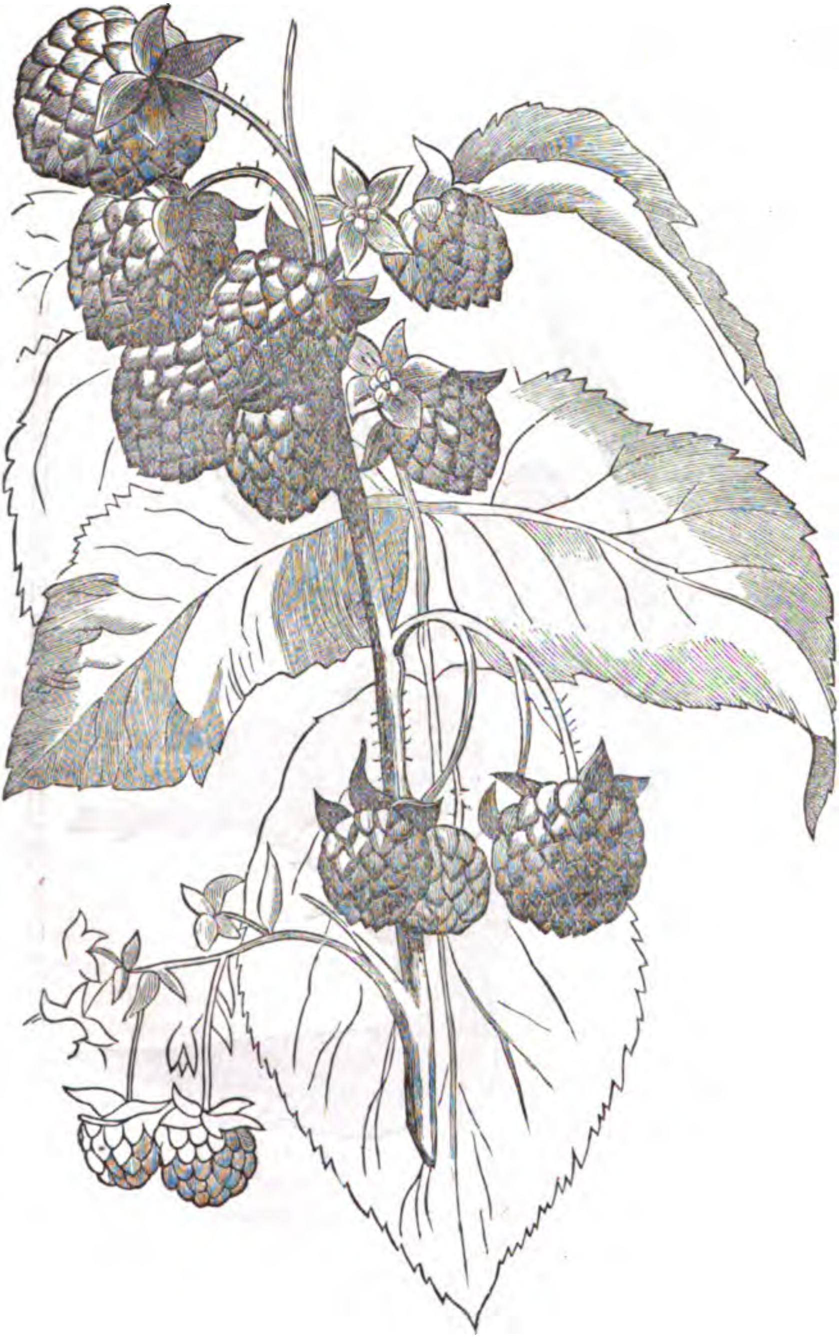
I desire especially to call attention to the Louis Philip as one of the varieties suited, as well as Early May, to Western culture, and as much superior to it in quality as a table fruit, as Rockport or Elton is superior to the old American Heart. I suppose my friend "Rural," M. L. Dunlap, will dissent, but while I give him credit for a great amount of knowledge, I believe the knowledge of this cherry is one little item which has not yet reached his brain, or he in his honesty and candor and love of public good, would have advanced its cultivation. My first experience of this cherry was in 1852, and when I wrote my book it had not developed its character in tree to form more than a bush, nor in fruit to exhibit aught but a hard cherry which enabled you only to speak of it as valuable, like all sour cherries, "South and West." As I now view it, after seventeen years of observation, I have no hesitation in awarding it a first place in all collection East, West or South. I send you a drawing from a cluster I cut from the tree last season without selection. F. R. ELLIOTT.



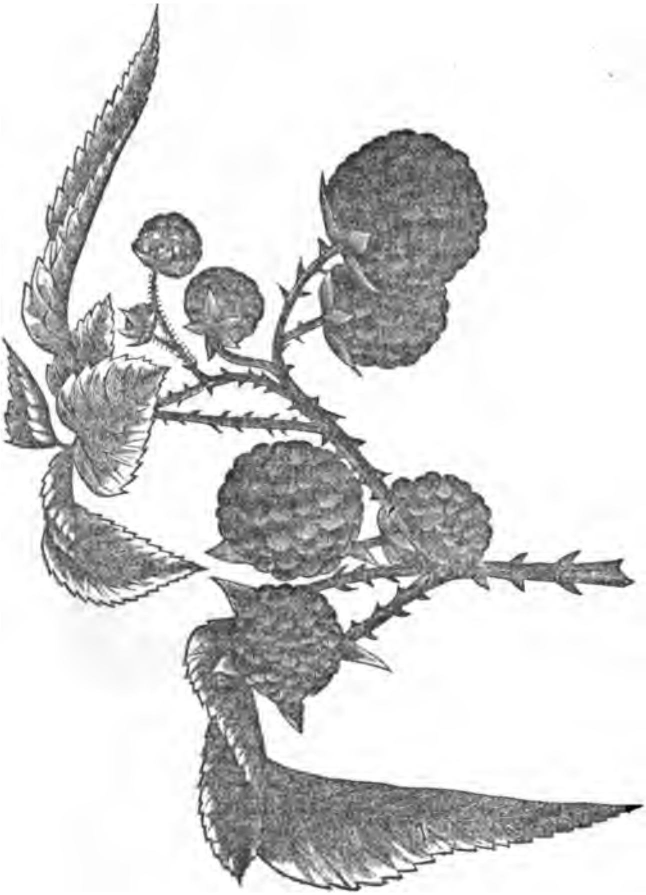
GREAT BIGARREAU OF MEZEL.

Synonyms.—Monstreaux de Mezel Bigarreau Gaubalis.

Fruit.—Size, very large; form, obtuse, heart-shaped, flattened on the sides; surface uneven; color, dark reddish puple, becoming apparently quite black at maturity; stem, long, rather slender, in a rather deep and regular cavity; pit, large, oval; flesh, purplish red, firm, a little coarse, juicy, sweet, and good, but none of the highest flavor. Season, last of June and early in July.



NAOMI RASPBERRY.



ARNOLD'S NUMBER ONE RASPBERRY.

Tree.—A strong, vigorous grower, rather crooked while young, becoming at mature age a broad, open, spreading tree, with large leaves, and producing abundantly a fruit that commands the highest price in market. It is possible the Great Bigarreau or Large Red Prool may be identical, but as there is some question of it, we have omitted the names in synonyms. The tree is of French origin, and came to this country with a loud flourish of trumpets. While young it is not a great bearer, but when the trees have acquired some twelve or more years of age they are good and regular bearers.

NAOMI RASPBERRY.

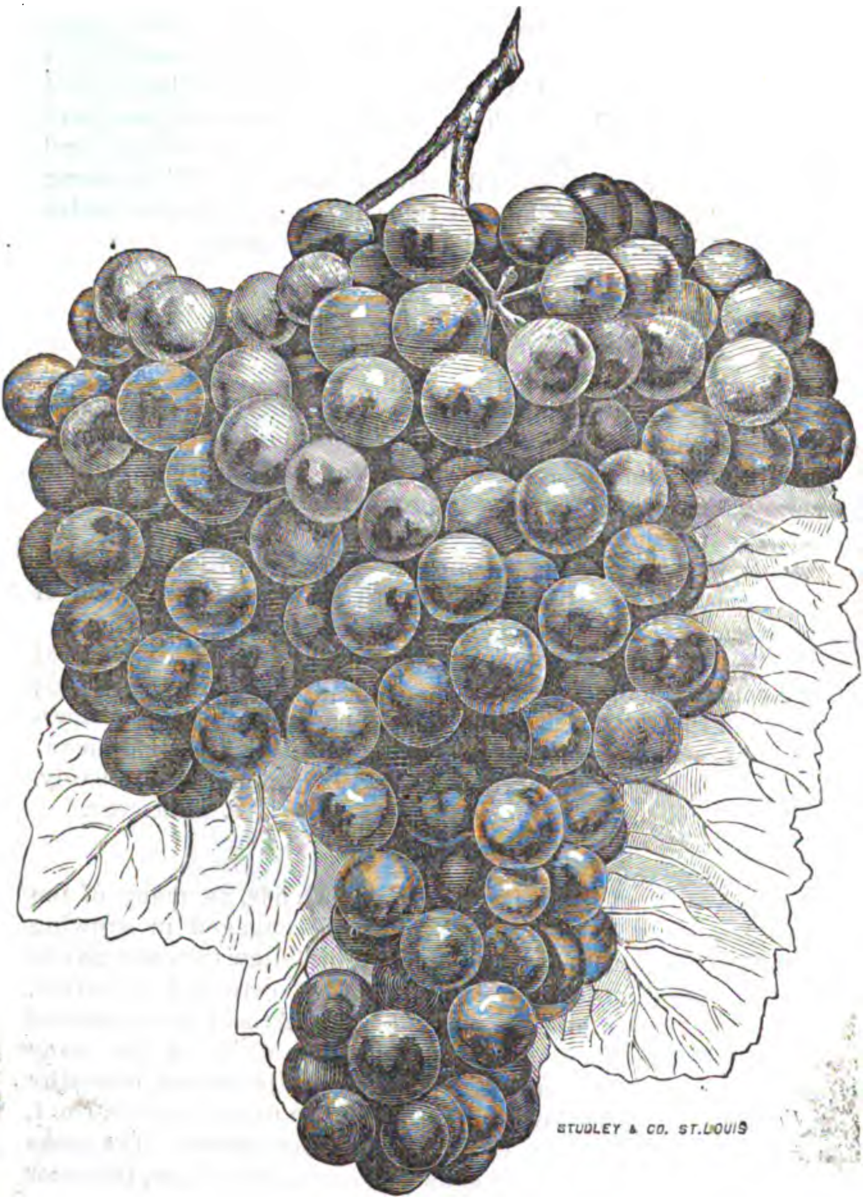
This is to the public a comparatively new variety, but observation of it for about twelve years, during which it has been grown without any but good common care in cultivation and entirely without winter protection—it was each year producing large and profitable crops of very superior fruit—induces me to place it in the department report, because of the great interest felt at this time in the cultivation of small fruits. It originated with Mrs. Governor Wood, of San Francisco, California.

Fruit.—Size, large to very large; form roundish, slightly conical or obtuse conical; hairs, long; grains, large; color, bright, rich red; flesh, firm and sprightly, rich and delicious; canes, strong, with numerous lateral branches when fruiting, brown, smooth, occasional inconspicuous spines; leaves, broad, lanceolate, very productive and hardy.

F. R. ELLIOTT.

Charles Arnold, of Paris, Ontario (Canada), has, as many of the *Rural* readers know, been for years diligently engaged in growing hybridized seedlings with a view to benefit his fellow man and give to the grower fruits of various sorts worthy of his care and attention, and superior to any yet known. In grapes, Mr. Arnold has promise of two or more, destined to be extensively grown, while of his many seedling raspberries, one only, according to *our* judgment, is worthy of general propagation; but that one, known to us as Arnold's No. 1, is the very best *hardy* yellow raspberry at present grown. The canes are strong, with numerous short spines, foliage light yellow, the color a light, whitish, greenish yellow, green, with long, narrow, projecting, prominent side buds. The fruit is roundish, oblong, conical in form, with large, roundish grains, firm, yet juicy, rich, sweet, pleasant, always agreeable.

F. R. ELLIOTT.



CYNTHIANA (*Syn. Red River.*)

The Cynthiana grape has attracted much interest within the past three years from the fact that the wine from it has been considered by connoisseurs as superior to the Norton's Virginia, which is high praise. Many inquiries have been made, and doubts entertained in regard to the identity and peculiarities of this grape. The cut represents very nearly the exact size of the grape. The bunch from which the photograph was made was furnished by Mr. George Husmann, of Hermann, Missouri, editor of the *Grape Culturist.* Mr. H. gives the following account of it:

Received by us in 1868, from Wm. R. Prince, Flushing, Long Island, New York. Origin, Arkansas, where it was probably found growing wild. It is a true Aestivalis in all its habits, and resembles Norton's Virginia so closely that it is impossible to distinguish the wood or leaf, although the bunch is generally somewhat more shouldered, and the berry more juicy and somewhat sweeter.

Bunch of medium size, moderately compact, shouldered. Berry below medium, round, black, with blue bloom, sweet, spicy, moderately juicy. Juice very dark red, weighs very heavy on the must scale, even higher than Norton's Virginia, and makes, so far, our best red wine. It has as much body, or even more so, than Norton's Virginia, but it is of exquisite flavor, much more delicate than Norton's, and can safely enter the lists with the choicest Burgundy wines.

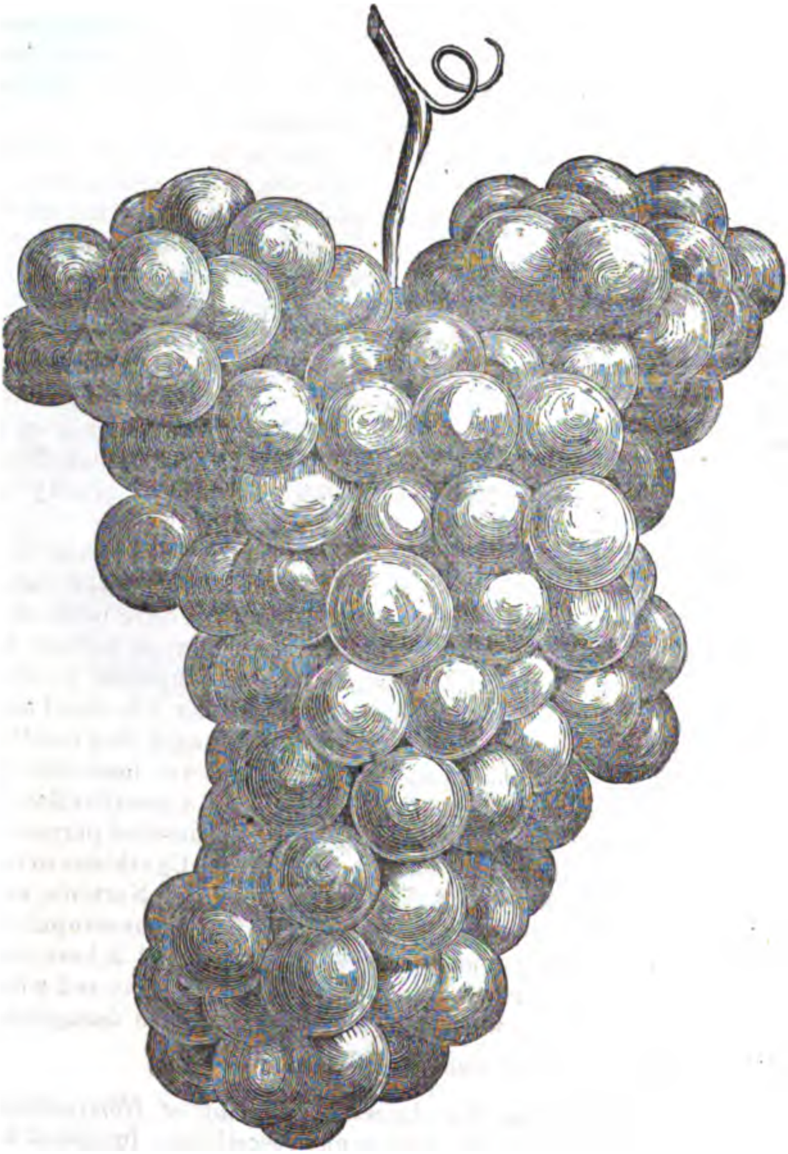
Vine, vigorous and healthy, productive, as sure in its crops of well ripened fruit *here* as any variety we know; but very difficult to propagate. Since it bore its first crop in 1859 we have never seen a rotten berry on it. The fruit ripens some few days earlier than Norton's, and about a week earlier than Catawba. Specific gravity of must, from 98° to 118°, according to the season.

While we can confidently recommend the *true* Cynthiana as the best grape for *red wine* which we have tried, we must at the same time caution the public against spurious vines, which have been sent out under that name. A variety resembling the Clinton, but not as good, has been sent out under that name, by unscrupulous parties from Illinois; and another variety, closely resembling it in wood and foliage, from Hermann, by parties who honestly thought they had the true Cynthiana. This spurious variety we have not yet been able to identify; it makes a darker wine than Norton's, of a peculiar flavor, resembling parched coffee, which may be useful for medical purposes, but does not resemble the exquisite wine of the *true* Cynthiana in the least. The close resemblance of the Cynthiana to the Norton's, and also to the spurious variety, will make it very easy for unscrupulous parties to deceive their customers; and as we introduced it here, and look upon it, so far, as our best and most reliable grape for red wine, we consider it our duty to warn the public against these deceptions.

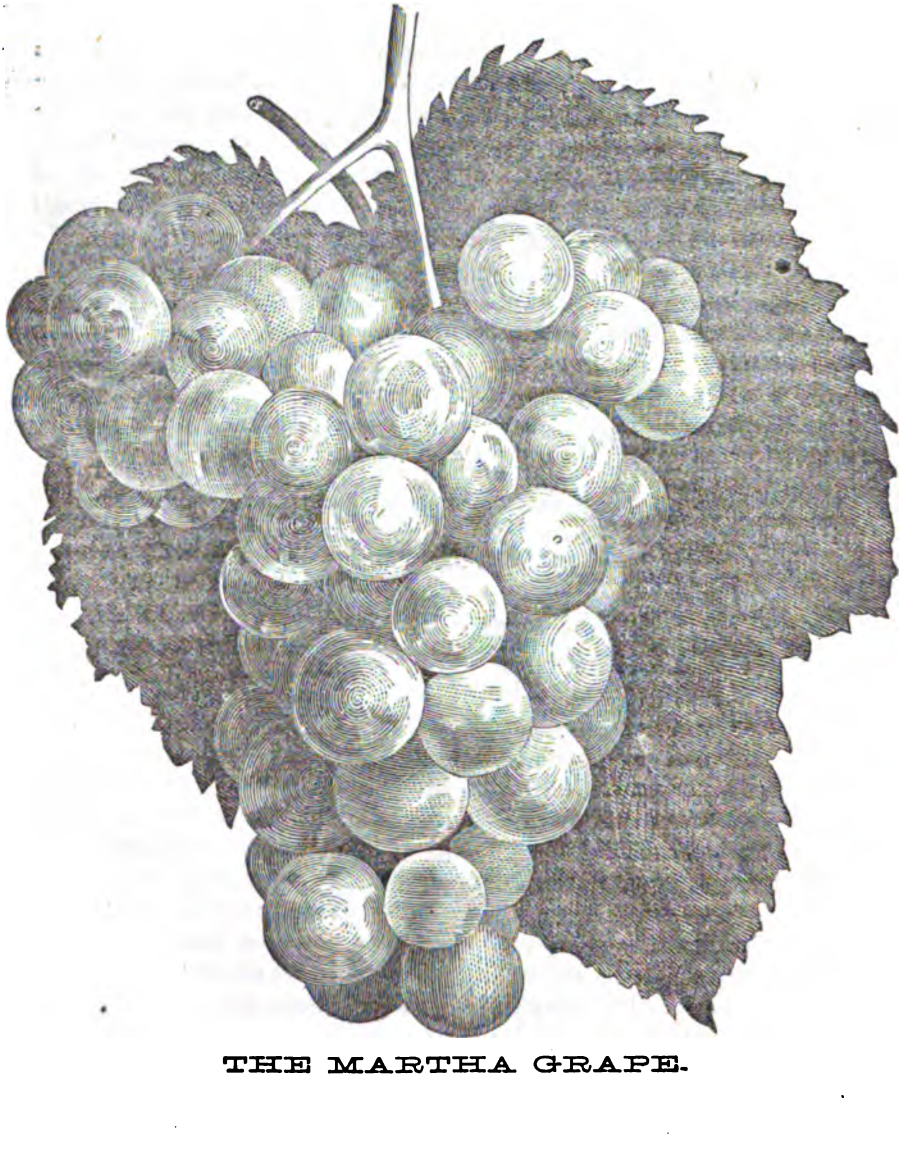
THE ONONDAGA GRAPE.

This cut is copied from the *American Journal of Horticulture*, Tilton & Co., Boston, also the following description, furnished by Messrs. Smith, Clark & Powell, of Syracuse, New York:

"The Onondaga is a seedling originated in Fayetteville, in this county: a cross between the Diana and Delaware. It appears to be entirely hardy, quite as much so as the Delaware, and matures its fruit at the same time with it.



THE ONONDAGA GRAPE.



THE MARTHA GRAPE.

"The color is amber; size good, nearly as large as Diana; it has a thick skin, and is a good keeper. In quality, it combines in some degree the flavor of both the Diana and the Delaware. In respect to growth, it is much like the Diana; the amount of wood not large, but the fibre strong and healthy.

"We also send a small cluster, which is a seedling of the Delaware; the berry small, but of very fine quality."

The editor of the *Journal* says:

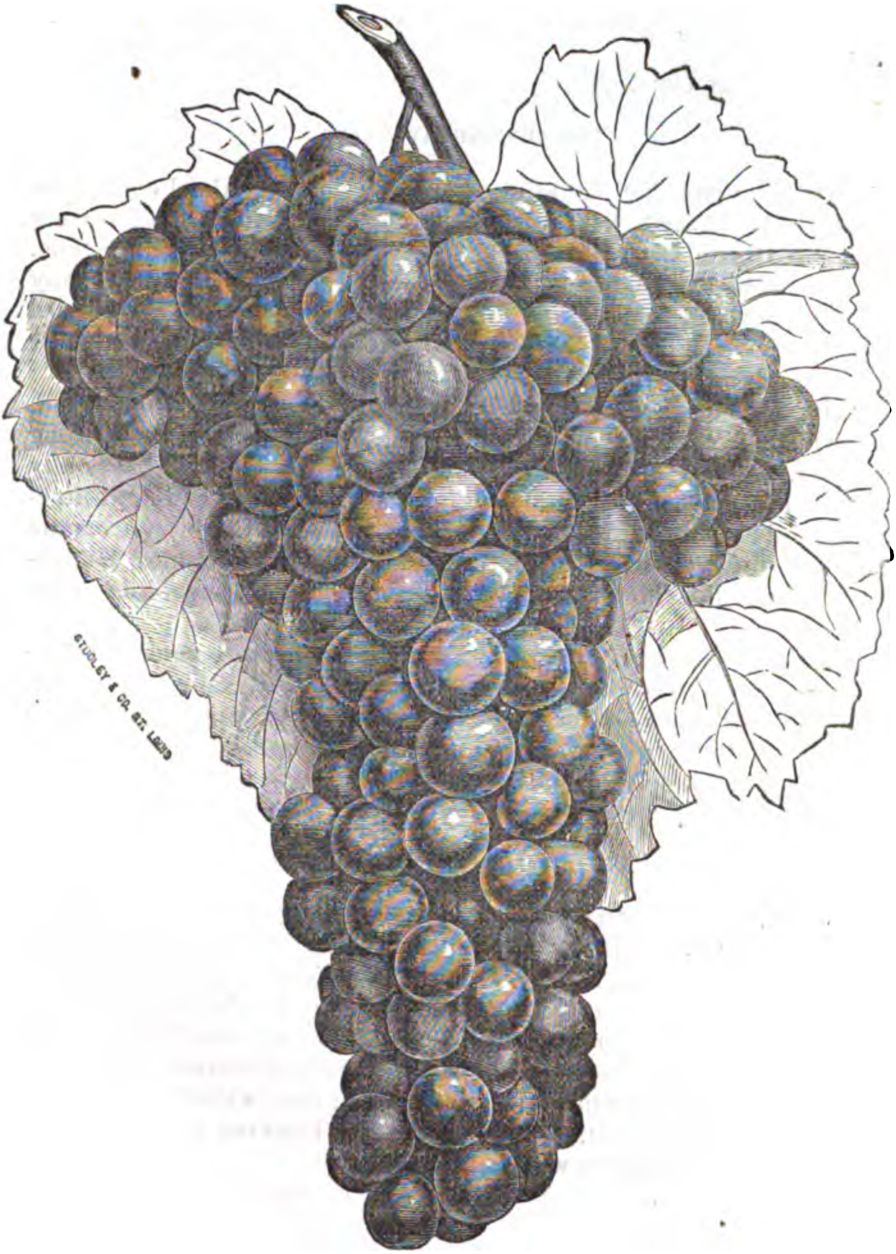
"Our impressions of the Onondaga, judging from the clusters alone, without having seen the vine, are very favorable. Its taste recall that of the Diana, but it has a sugary sweetness peculiarly its own. The berries are very thick set, and crowd one another very much like those of the Isabella. As the Diana is an old favorite of ours, we shall watch the Onondaga with much interest. The small grape alluded to above was an extremely sweet, delicious little grape; Delaware-like in flavor, without a particle of pulp; but wholly unfitted for general cultivation, unless the size of the bunch and berry can be much increased."

THE MARTHA GRAPE.

The above is a fair representation of the Martha grape, as grown the past season, upon a young vine, in its second bearing year. It is a seedling from the Concord, originated some ten years since, by Samuel Miller, Esq., formerly of Lebanon, Pa. In all its habits of growth, it is much like the Concord, and seems fully its equal in health, hardiness, and luxuriance of foliage, as well as productiveness. In general appearance its foliage is nearly identified with Concord, with the exception that the leaves are of a lighter shade of green. The wood is also of a darker brown.

In color, the Martha is a perfect contrast to the Concord, being a delicate greenish yellow, and when fully ripe amber-tinted next the sun, covered also with thin white bloom. Skin thin, but tenacious, and does not crack in wet wheather. The past season unusually wet and cloudy weather prevailed during the ripening season; and while many varieties, Concord included, were badly injured by cracking of the berries, the Martha remained perfect. In quality it is decidedly of the Concord type and flavor, but more delicate, sweet and rich, with a pleasant, vinous sub-acid, and no coarseness or acridity next the seeds or skin. Pulp slight and tender; seeds few and very small; buches medium; berries medium to large.

Wherever the Concord succeeds the Martha may be relied upon, and is undoubtedly the most valuable white grape yet introduced for general cultivation; for it seems to possess the peculiar adaptability of its parent to every soil and situation suited to the vine. And as it is of finer quality, and ripens a week or ten days earlier, is worthy of even a higher place among white grapes than the Concord



THE CUNNINGHAM GRAPE.

holds among black ones. It has been found the past season to make a delicate white wine, of great richness and body, the must indicating 92°. It has never shown mildew nor rot, and the berries hang firmly to the bunch, never dropping, even when over-ripe.

GEO. W. CAMPBELL.

DELAWARE, OHIO.

THE CUNNINGHAM GRAPE.

Origin somewhat doubtful at present, but our valued correspondent, Colonel Werth, has promised to send us an article on its origin and early history, which we shall be happy to publish in due time. It belongs to the same class as the Herbemont, Lenoir, and many others peculiar to the Southern States, and which we believe are either a division of the Aestivalis, peculiar to the Southern States, or hybrids of the Aestivalis and Vinifera.

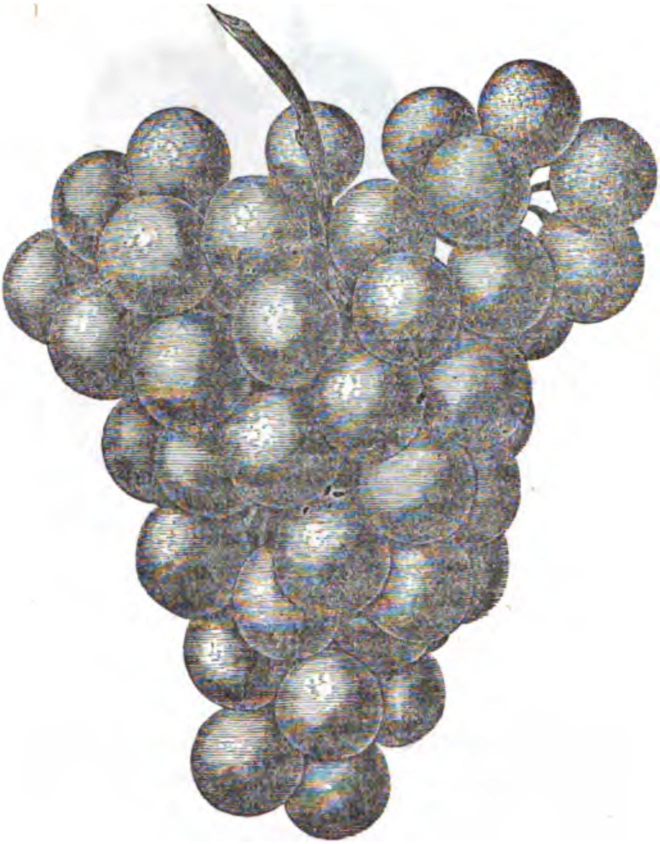
Bunch compact and heavy, medium, shouldered; berry small, brownish black, juicy and vinous; free from disease; vine a strong grower, healthy, but requires slight winter protection. Especially adapted to our southern hillsides, as it seems to revel in light limestone soil; ripens its fruit late, but makes one of the most aromatic and delightful wines we have, resembling some of the finest Hungarian wines. Specific gravity of must from 90 to 112°, according to the season.

The Cunningham grape is worthy of much more general attention than it has received so far, especially for our Southern States. An acquaintance of over 12 years with this variety, enables us to speak knowingly, when we recommend it for general trial in southern locations, and limestone soils.

GEORGE HUSMANN.

THE MOTTLED GRAPE.

This grape has attracted considerable attention in some parts of Ohio, especially at Kelley's Island and along the Lake Shore. Dr. Spalding, of Missouri, and Dr. Hull and Mr. Kingsbury, of Alton, Illinois, saw it in the vicinity of Cleveland, Ohio, last fall, and reported upon it rather unfavorably, stating that it is no better than the Catawba in any respect—much like it in growth and foliage, and in some respects inferior in quality of the fruit, having a thick, tough, acid pulp. Mr. F. R. Elliott, of Cleveland, Ohio, however, maintains that it has superior merit for wine making.

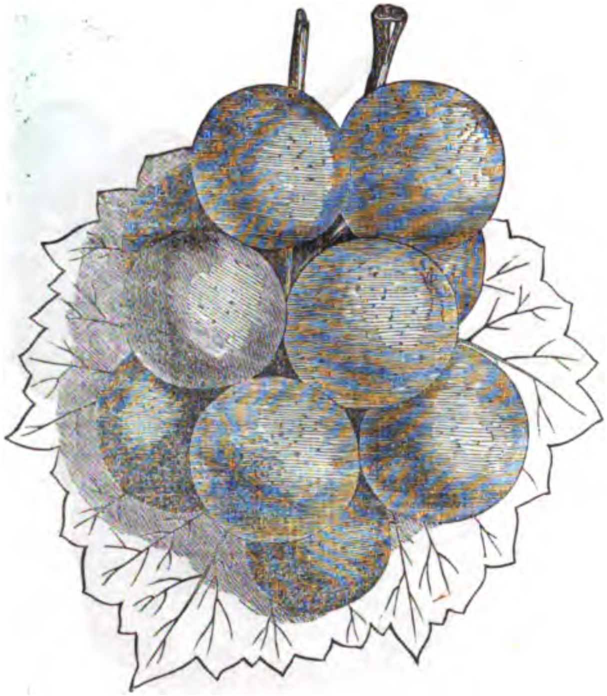


THE MOTTLED GRAPE.

The Scuppernong has attracted a remarkable degree of attention in the Southern States within the past two years, and anxious inquiries in regard to it have been excited among the grape growers in more northern localities.

It is a native of the South, and will scarcely flourish as far north as the southern part of this State. The following is what is said of it by Mr. George Husmann, of Hermann, Missouri:

"Our friends of the South are turning a great deal of their attention to this grape, and some efforts have even been made to introduce it in Missouri. We can only say, that although it may be all they say in their climate and soil, it would prove utterly worthless here, and in this we speak from actual experience. In 1848, Mr. Charles Tenbner brought a number of Scuppernong vines, of both the white and black varieties, from Alabama, and planted them on the place where we now reside, in the neighborhood of Hermann. These, although they



SCUPPERNONG.

would winterkill every winter, down to the snowline, have several times produced fruit, and one of the original vines is still growing in the vineyard. When we thought the fruit ripe, in October, we have tasted it several times, and confess that we found such a strong *bug* flavor, and so little sugar in it, that it seems absurd in the extreme to us, to speak of acclimatizing it *here*, or making wine of it. It may be very good at the South—for climate and soil will work wonderful changes—but it will never do here. It needs a warmer climate than we have here, to develop the good qualities they speak of, and must always remain a Southern institution. And we even believe that our Southern friends, when they have tried those varieties so eminently southern, Herbemont, Cunningham and all of that class, will become convinced that they are better than their present favorite, the Scuppernong, even with them:"

THE CHEAPEST MANURING.

AN ESSAY READ BEFORE THE MADISON COUNTY, (ILL.) FARMERS' CLUB, MARCH 7TH, BY L. D. MORSE.

Mr. President and Gentlemen:

There is no poetry or sentiment in the subject you have assigned me, but there is in it a vast deal of honest value, and it is a subject of primary importance in all good farming. No other subject of equal importance in farming is more sadly neglected by the mass of Western farmers.

For the cheapest manuring we must unquestionably look to those agents which exist upon, or which are or may be produced upon the farm. First, most common, as well as most valuable among these, is the barnyard manure. This being the case, attention should be directed to the best method of saving and using this important agent; and every barnyard should be constructed and arranged with this end in view. It should be well enclosed, of sufficient size to comfortably accommodate the stock, and not larger. It should be situated upon ground as nearly level as possible, or rather it should be "dishing," that is, with the lowest point in the center, so that the manure will not be washed away.

It should be abundantly supplied with good water, for the convenience and health of the stock, as well as to prevent the scattering of manure by traveling to a distance for water.

The barn roofs should be supplied with gutters for the purpose of conducting the water off from the yards in drains, or into cisterns, if needed for stock water. Manure is damaged by being too much saturated with water, and the yard is made uncomfortable for stock.

The stables should be so constructed as to conduct the urine of animals into closely covered tanks, to be used in a liquid state, or into vats, to be absorbed by turf, muck, peat, top soil, or clay. Urine is considered the most valuable part of the barnyard manure, yet most of it is generally wasted, or at least no pains taken to save it. Covering the stable floors with plaster, muck, or some other absorbent of ammonia, should not be neglected, both with a view to saving manure and the health of the animals.

There should be enough of straw, cornstalks, turf, muck, or other suitable material in the barnyard to absorb the liquid manure, and at proper times it should be gathered and put in heaps under shelter, combined with a proper quantity of such absorbents as have been named. The object is: first, to prevent it from being too much washed by rains; second, to promote fermentation, which to a degree is useful; third, to prevent, by combination of different qualities and with absorbents, an undue degree of fermentation and heating, which "fire-fangs," or burns it.

If there is no undue degree of heat in the compost heap, it should not be forked over for the purpose of mixing until it is required for use, but should be kept covered with turf or soil.

The poultry manure partakes of the nature of guano, and, so far as it goes, is the most valuable manure on the farm. It will pay to have a good poultry house, with the floor covered with a suitable absorbent, so that it may be saved and composted for use where choice manure is desired.

All dead animals, if buried and composted, make very valuable manure. If they are allowed to die from neglect, or poor keeping, it is far from being cheap manure. The carcass of a horse is said to be worth a ton of stable manure. The blood of animals slaughtered, if immediately composted, or absorbed by proper material, is highly valuable, and costs but a very little trouble.

The soap suds and all the house slops should be turned or conducted into a cess-pool, where they may be absorbed by turf, muck, etc., thus making very valuable and cheap manure.

The farmer who has a bed of muck upon his land is lucky. Its value for composting is very great. In the absence of muck or peat, turf, top soil, or clay may be used as absorbents. The clay of subsoils is generally rich in fertilizing material, but lacks humus. It may be used with great advantage in the compost heap, where by combination with animal and vegetable matter it becomes excellent manure. It is the very best absorbent of ammonia, but owing to its sticky or adhesive nature may not be as pleasant to use in stables as gypsum. Its value for this purpose is believed to be greater than plaster, and it is a question in my mind whether it ought not to be preferred. By exposing it to frost and the weather it may be readily pulverized.

It should not be forgotten that all the ashes made upon the farm, leached and unleached, and even coal ashes, are very valuable and cheap manures.

As to the commercial manures, it *may* be advisable to buy plaster, or salt, for use in the compost heap, and in some circumstances guano, the phosphates, etc., but they can scarcely be considered as belonging the subject of "cheapest manuring."

Lime ought to be mentioned as a valuable manure, which may be cheaply manufactured on many farms where limestone is plenty.

In theory, like ashes, its application is beneficial to every soil not already sufficiently charged with it. Like the tippler's grog, which is good when he is wet and good when he is dry, good for cold and good for heat, so lime is said, with truth no doubt, to make heavy soils lighter and light soils heavier. It is useful in converting the insoluble matters in the soil into available plant food. It condenses and retains volatile gasses brought into contact with it, proving a useful disinfectant. Of its use on Western soils, neither my experience nor observation enables me to speak with positiveness. Ashes we know to be excellent for our soils, and lime ought to be good upon a similar principle.

Lastly, though perhaps not of minor importance, we have to consider manuring with green crops. For this purpose the leguminous plants are generally preferred. The botanists place the clovers in the order *Leguminosæ*—with what reason is not very apparent, as the legumes are pod-bearing plants. With the value, importance, and cheapness of the Red clover crop as a manurial agent, every one is presumed to be familiar. Its use for this purpose is much more common than any other crop. The first crop should be cut for hay, and the second growth of the same season plowed under for manure. There are other crops, however, possessing some advantages over clover for green manuring, which have received very little attention, especially in this region. Southern planters have long used the Cow Pea for this purpose, and regard it as the best of the fertilizers for the South. There it will mature two crops in a season. Allen, in his *Farm Book*, says: "The Cow Pea is an economical fertilizer, in consequence of its broad, succulent, bean-like leaves, drawing nitrogen and carbonic acid largely from the air, but its slight fusiform roots do not affect that mechanical division so beneficial to many adhesive soils, which is produced by the long tap roots of the clover."

I believe beans to be one of the very best crops to grow in this latitude, for green manuring. They have an advantage over clover in being grown quickly, and over the Cow Pea, or any pea, in having more deeply penetrating roots; in this respect they are second only, if not equal to clover. They are equal, if not superior, to any crop in the amount of fertilizing material which they will draw from the air. They may be sown broadcast, and covered with a cultivator or harrow, or drilled closely, and allowed to grow without cultivation. In sixty to ninety days an immense mass of green foliage may be produced, fully equal in value to anything that can be grown for plowing under for green manuring. They may be sown between the middle of May and the middle of June, or even later, and be ready to plow under for fall wheat; or they may be sown as late as the middle of July (in this latitude), and a good crop produced to plow under late in the fall for a spring crop.

The common small, white field bean may be used. The best variety, perhaps, for this purpose is the American Newington Wonder, a variety not in very general cultivation, I think, in this portion of the West. It is a healthy, vigorous, and remarkably prolific variety, producing a large mass of vine and foliage, as well as an immense yield of seeds. Burr, in his *Field and Garden Vegetables*, speaking, I suppose for the latitude of Boston, says: "The variety is not early, and when cultivated for its seed, should have the benefit of the whole season; though, with favorable autumnal weather, the crop will ripen if planted the middle of June. Spring plantings blossomed in eight weeks, and ripened in a hundred and six days."

I planted this variety last July—I think nearly or quite as late as the middle of the month—and they ripened a good crop, with, as you are aware, remarkably little rain. The Drab Tampico and Turtle Soup are varieties quite similar in character, the former earlier, and the other later than the Newington.

I have now, as I think, touched upon the chief and most practical points, and alluded to some of the details of the cheapest manuring. Subsoil plowing and under-draining, perhaps, might be properly considered in connection with the subject, as contributing in an important degree to the improvement of soils by aeration, and by fitting them for receiving and retaining fertilizing materials brought down by rains and snows, and being, in the long run, cheap; but I have already indicated points sufficient for present consideration and discussion.

DEEP PLOWING.

An Address delivered before the Hickory (Warren County, Mo.) Farmers' Club, by the President, G. W. Kenney, Esq.

For a person to be a successful farmer in this age of improvement and progress, requires as much study, research and patient investigation as it does to become successful in any of the so-called learned professions.

The universe is governed by certain fixed and unchangeable laws, which under the same circumstances always produce the same effects; and when we once become acquainted with those laws, we may rest assured as to their final result. Nothing is done by chance. Everything has a cause, and certain causes always produce certain effects.

There should be a reason for every act of our lives; but we farmers do many things there is no reason in, and very little sense. We do certain things because our fathers did the same, and never stop to inquire whether they reasoned upon the matter or not. This is all wrong. We must know the why and the wherefore; and one object to be accomplished by this club will be teaching us to think for ourselves.

The subject of deep plowing is one which has commanded much attention lately, and is the one which I have chosen for this evening. Until quite recently, six inches was considered deep, but now twelve, eighteen and even twenty-four inches has become the practice in many localities, with the most gratifying results.

The object of cultivating the soil is to raise a crop of plants; and to do it profitably, we must raise the largest possible quantity with the least expense, and without injury to the soil. This we do not always do; for it is well known, especially in this vicinity, that our soils are getting poorer every year. If we study the character of plants, we find that they take up food through their roots—chiefly through the ends of their roots, which are called spongioles, from their resemblance to a sponge—which is carried in the sap to the leaves and branches, where it extracts other nourishment from the air. This food can only be taken up in a solution of water, and consequently there must be moisture in the soil if we expect plants to thrive. In order to do this we must loosen the soil so that the roots can get down where the moisture is. We need not expect tender roots to force their way in a dry time where it is impossible for a strong man to force a crowbar. We must mellow up the soil. All agree that we can raise crops enough in Missouri if it will only rain when we need it. But we cannot make it rain, and we must find some way to get moisture without it. Can we do this? I think we can, and will attempt to show how. It must be done by deep plowing, and thorough cultivation. All lands do not require deep plowing—such as have an open, porous subsoil for five or six feet or more, like the Missouri bottoms, some of the lands in the vicinity of Kansas City, and some other sections of the State. What I say in favor of deep plowing, I think applicable to our immediate vicinity, where we have a tenacious subsoil within a few inches of the surface. There is always the same amount of water in and about the earth's surface. It is either in the ground or in the atmosphere, in the form of vapor. In the winter there is more in the ground than in summer, for the reason that the heat of the sun evaporates it, and it exists in the air in vapor. Whenever this vapor comes in contact with substances colder than itself, it gives up its heat and is condensed, again becoming water. We can see it in summer collected upon the outside of a pitcher of ice water. The pitcher looks as though it was sweating. No one believes that it comes through the pores of the pitcher; it must come from the air. If we breathe upon an axe in winter we see it covered with frost or frozen vapor. The cold comes from the axe, the water from the breath. In summer, every night, when the ground is not too much parched, the cold earth receives moisture from the atmosphere in the form of dew. The same process takes place in the soil.

When we open the soil, and mellow it up deep, so as to allow the air to circulate freely among its particles, and reach the lower and cooler portions, the process of condensation takes place, and moisture is abstracted; but unless we plow deep enough, so that the soil below is cooler than the air, no dew will be deposited. If we take two vessels of pulverized earth, one six the other eighteen inches deep, and place them in the sun, the one eighteen inches deep will be quite moist at the bottom, while the other will become quite as dry as though baked in an oven. The one six inches deep becomes hot, and all the water is evaporated or boiled out of it, while the other is cool and condenses moisture from the atmosphere. Some will say there is no moisture in the soil in a dry time two feet below the surface, because they have dug down and found it dryer than the surface. That is true, unless the ground is mellow. If it is a hard pan it is impossible for the air to circulate there and give up its moisture. I would not advise turning the surface soil under so very deep all at once. Six inches would do no harm; but the ground below should be mellowed up with a subsoil plow. This is an implement that runs along in the ground like a mole, in the bottom of a furrow made by the common plow, raising and pulverizing the earth, breaking up the compact, cold and waterproof under stratum of heavy soil, allowing it to fall back in its former place, and leaving the thin layer of vegetable mold on top where nature placed it. A tolerable good substitute for the subsoil plow is a narrow, sharp shovel plow, with a long shank, that would follow in the bottom of the other furrow without throwing the dirt out. The most convenient and expeditious way is to have one team attached to the common plow, and with another to follow immediately behind with a subsoil plow in every furrow, although one team might do the work by changing plows every round.

The effects of all plowing, whether deep or shallow, is to admit air, and consequently moisture to the soil, and to allow the roots to travel to a greater depth into the loosened particles in search of food.

You will, perhaps, object to deep plowing, saying it is too slow, too much hard work, and that we cannot cultivate more than half as much land as we now do. I admit that it is slow to begin with, but what time we lose on the start, is more than made up before the season is out in increased ease of cultivation. It is also hard work, but we never get rich *honestly* without hard work; and if we do not cultivate more than half as much land, we shall raise as much on ten acres as we did before on twenty, make just as much money, and have the other ten for grass or rest. This evil of cultivating so much land is peculiar to the West, and it will take something more powerful than my advice to correct it.

By deep plowing we admit an increased supply of atmospheric fertilizers. The air always contains large quantities of carbonic acid and ammonia, which are impurities for us to breathe, but are life to all manner of vegetables; about one-half of all vegetable matter is carbon. When wood is burned in a close vessel, or otherwise confined from the air, as in a coal pit, we have carbon or charcoal left. If we burn it in the open air, the oxygen of the air mixes with the carbon, forming carbonic acid, which is an invisible gas. The same occurs when vegetable or animal matter decays, which is only a slow process of burning; the same also with food digesting in man or other animals.

When we breathe air into the lungs, the oxygen of the air unites with the carbon of the blood, and we exhale carbonic acid. Thus the plant that dies gives up its life to contribute to the growth of other plants. The smoke which ascends from our chimney contains material for the formation of food for our table, and fagots for another fire. Where the air has an opportunity to circulate through the soil it gives up these fertilizers to enrich it. When the rain falls, it extracts fertilizers from the air, and if we plow deep, and allow the water to pass through the soil instead of running off on the surface, we shall enrich the ground, at the same time that we are making the atmosphere healthier. If we wish to ascertain whether this is fact or fancy, we can very easily do so. We will fill a barrel with one-third clay and two-thirds sand, well mixed, or with charcoal and sand; now pass through it the liquid drainings from a manure heap, and we find that the water has given up all its color and all its smell, left all of its fertilizing material in the barrel, and passes out pure and clear as crystal.

You have often observed that fresh rain water had a peculiar color altogether different from spring water. This coloring matter is the fertilizing element, and is absorbed by the soil. There is no soil equal to clay for absorbing and retaining fertilizers. You may take the poorest spot of clay you can find in the bottom of our roads, where it has been gullied out, and by plowing it deep and often, turning it over and mellowing it up, it will absorb fertilizers from the air and water passing through it, until in time it will become as fertile as a garden, without ever applying any manure directly to it; but if we apply manure from the stock yard and stock pen, plow under green crops, especially clover and sod ground, we hasten matters very much. By deep plowing we warm the lower parts of the soil, thus hastening the growth of plants at all times, but more especially in the spring; because heat is withdrawn from the whole amount of air circulating through the soil, and because where rain falls upon the parched ground it robs the surface of a portion of its heat, which is carried down to equalize the temperature for the whole depth. The heat of the rain water itself is given up to the soil, as we find that water passing out of a drain is from one to ten degrees colder than when received upon the surface. By admitting air we hasten the decomposition of roots and organic matters in the soil. This decay of roots, besides its other benefits, also produces an amount of heat perceptible to the smaller roots of plants. By this, also, we decompose or disintegrate the mineral parts of the soil, which is necessary to its fertility; because the roots of plants can only feed on such matter as is dissolved in water, or has been exposed to the influence of the oxygen of the air. The finer we pulverize the soil, the more surface we expose to its influence. As Mr. Osgood told us, the interior of a stone could furnish no food to a plant, but if finely pulverized might make a very fertile soil. By admitting air to dissolve the minerals we improve the mechanical texture of the soil, render it easier to be worked, and prevent it from packing and running together; the baking or crusting over of the surface would be prevented. This is caused by the evaporation of water in the ground, which would not be so great in deep as in shallow plowing. It deepens the soil by the decay of roots which draw up materials from below, rendering the subsoil and surface more alike, so that finally we can turn the bottom on top without any injurious effect. Mr. Quincy told us that where they plowed deep last spring, and throwed the subsoil up, they raised no better corn, and perhaps not as good as others who plowed shallow. It was turned up cold and sour, and corn immediately planted on it. No wonder they did not astonish the natives. The warming influence of the sun, and the action of the atmosphere had not yet had time to exert their good effects; but wait, time will tell, and if its good effects are not visible on that field for years, then I'll admit that my philosophy is not worth much. By deep plowing, like under-draining, we are enabled to work earlier in the spring, and sooner after rains, because the water passes into the ground instead of laying on the surface to be taken up by the slow process of evaporation.

For the same reason the freezing or throwing out of grain in the winter would be prevented. The water remaining on the surface is frozen and expands, the particles assuming an upright position, causing the ground to look like a honeycomb, and the roots are pushed entirely out of the soil. When it thaws again, the little dirt left on the roots runs off leaving them bare; when it freezes again they are killed. This is in a great measure prevented by drilling in wheat, for the little ridges left between the rows run down on the roots and keep them covered.

The subsoil often contains matters which are deficient in the surface soil. By deep plowing these are rendered available.

On lands that are very wet, I believe that it is not generally considered best to subsoil until it has been thoroughly under-drained; but on all that are sufficiently dry, and have a clay subsoil, it is always recommended. For this reason I think it just the thing needful for our section. If plants will grow better in a soil six inches deep than in one three, there is no reason why they will not be benefited in proportion by going still deeper. Many people suppose the roots of plants to grow just upon the surface; but it has been proven that the roots of corn travel more than two feet, and the roots of wheat have been traced even seven feet deep. The onion, that grows best with the bulb entirely out of the ground, sends its rootlets down eighteen inches in search of food, when properly cultivated. The parsnip has been known to grow to the depth two and half feet when if at the depth of eight or ten inches it meets with a cool, hard pan, its growth will be arrested or its form injured.

We all know that a garden soil of two feet is better than the field soil, and it is certain that with proper cultivation we may make a garden of the field, doubling its value in case of cultivation, security against drouths, productiveness and profit. The character of the subsoil will be much improved the first year, and in time, will become equal to the surface soil.

The subsoil plow has ceased to be a curiosity. It is coming into general use; and as some one says, "the man who objects to its use may be classed with him who shells his corn on a shovel over a half bushel, instead of using an improved sheller, or who reaps his grain with a sickle rather than with a Kirby Harvester, which make him do more in one day, than in the good old way in a week."

RESOURCES AND INTERESTS OF THE WEST,—FROM MEXICO TO BRITISH AMERICA.

BY AMERICA.

Now that the election has passed may it not be well for us to take a "look ahead," and, as fast as possible, develop the resources and interest of our country. With this object in view let us divest our robes of selfishness and prejudice and look for facts, and if discovered, act upon them as rational beings. Let all sectional feelings be buried as of the dead past—it is a living, *well considered future* in which we are now deeply interested.

First, let us look at Texas. The lower counties of Texas, or south of the Nueces river, are nearly valueless for any purpose, for various reasons. The entire country west of a parallel of longitude 93°, embracing Texas, Arizona, and New Mexico, are subject to long-continued and excessive drouths. The careful observer will have noticed that Kansas, Nebraska, and those new States still west of them, are also liable to the same difficulty. During these drouths the grass not only suffers, but all the lakes, lagoons, and streams become so brackish or salt that stock of all kinds refuse to drink at them, and perish for want of water. With here and there an exception, the entire stock of the country near the Rio Grande river have to be watered at wells. Gen. Taylor, on his march from Corpus Christi to the Rio Grande, was obliged to dig wells each day to supply his army with water; they are at this time in very good repair; they are from twelve to twenty feet deep, and from twelve to twenty-four feet in diameter; they require no walling up; but one of the wells in a distance of a hundred and fifty miles is palatable; it is known as the "Sweet Well;" all others are so brackish as to be very disgusting, but can be used. The traveler fills his water cask or flask at the Sweet Well; if traveling by team, two or three days' supply are usually taken. Sometimes heavy rains occur; man and beast then rejoice, for it renders all streams of water palatable for a few days. Not a foot of soil is cultivated in all this region; and more than ha the country is a dense thicket of several varieties of prickly pear, and cactus of various sorts, from three to thirty feet high, interwoven with the chaparral thorn bush, which sometimes attains a height of six or eight feet. Little prairies are numerous, in area from one to ten, twenty, or more acres, connected with each other by foot or cattle paths, all of which the Mexican understands as well as the mariner does the channel among the islands off New York. Many, no doubt, recollect how the Mexicans would rush out from these enclosures upon Taylor's army. The road he cut through this wild country in many places is not over ten feet wide. It is now the mainly traveled road from Corpus Christi, in Texas, to Matamoras and Monterey, in Mexico.

Another reason why the country is so worthless, is from the excessive grazing, the grass being entirely destroyed. The traveler will not find a blade of our northern grasses south of the Arkansas river and west of longitude 90°—it can not live. The bottom lands of the San Antonio, Guadalupe, and Colorado rivers produce good corn and cotton—*if it only rains.* In this belt of country large stocks of cattle, horses, and sheep subsist, nothwithstanding the great lack of water at times. Very little land is cultivated in the intervals between these rains. At San Antonio City they irrigate, and get excellent crops. It is in this belt that Kendall has his sheep ranch. The Germans in Newbraunfels, Comal county, are more successful in cultivating the soil in this belt than any other class of people. It is not adapted to agriculture by any means.

From the Colorado river to the Brazos river the soil is very rich, but the drouth is too severe for successful cultivation. The distance from Austin to Waco is one hundred miles. For Southern towns they are places of considerable business; there is no town of any importance intervening. Austin is on the north back of the Colorado, and Waco on the south bank of the Brazos. Hundreds of thousands of cattle once grazed between these rivers, but the grass gave way from the constant pasturage of summer and winter, and it is now one interminable sea of weeds, and the mass of stock has "gone west" to "eat out" another section, and then "go west" again.

The prairie lands north of the Brazos river are well adapted to wheat, and seldom fail to remunerate the farmer well for his labor.—Wheat grown upon these prairies weighs 63 to 65 pounds to the bushel; the quality is unequaled in any part of the world.

The bottom lands of the Brazos, Trinity, and Red rivers can beat the world in corn and cotton. The prairie soil north of the Brazos to Red river is exceedingly rich. It is formed from the disintegration of the chalk rock which underlies it.

Eastern Texas is a timbered country—"piny wood"—with a poor, sandy soil, for the most part. The bottom lands of all the rivers and small streams produce corn, cotton, and the sugar cane in wonderful quantities; and some of the interval lands are cultivated successfully.

There is a belt of most magnificent pine land lying in Eastern Texas and West Louisiana. Millions of feet of logs perish yearly for want of mills to cut them up and facilities for marketing.

Elis county has more good acres of land than any other county in the State; every foot of it is good wheat land, and yet not one-twentieth of it is cultivated.

What Texas wants is railroads to market her products of cattle, horses, sheep, goats, swine, wheat, corn, sugar and pine lumber. With the Massachusetts system of railroads to develop the wealth of the soil, that portion of country, say from the Brazos to the Red river and east of the Cross Timbers, would soon rival any other section of our country of equal extent. Northern farmers and railroads alone can do it.

Our description of Texas is designed to apply mainly to that portion of country lying east of the Cross Timbers and south of the river Neuces.

We regard Grayson, Farrin, Dallas and Elis the best four counties in the State for wheat. For stock raising one should go west of the Cross Timbers.

THE INDIAN "NATIONS"

occupy a section of country lying directly north of Texas and south of Kansas. The geological structure changes materially the moment you cross Red river, and with it the character of the soil. It is much less fertile, and is well supplied with timber. It is a desirable country, and the white man will soon crowd the poor Indian further west.

During our travels in that country, we found many of the so-called Indians intelligent, and possessed of large stocks of cattle and horses, and in many instances well cultivated fields. This was especially so among the Cherokees.

We were there in the autumn of 1859, and were delighted with much of the country. The scenery, in many instances, was simple, beautiful, but often grand and gorgeous. Passing north we enter

KANSAS.

Of all the prairie States, we regard this as the most beautiful in point of landscape. Its soil is very rich and fertile, if it rains sufficiently to mature crops; but it is in the line of the dry mountain winds of the south and west, and must necessarily be subject to severe drouths. This remark will apply to all of those new Western States. Success in agriculture in some of them will depend almost wholly upon irrigation. Comparatively few of our people seem to be aware of this fact.

MISSOURI,

of all the Western States, now offers to the emigrant (in our opinion) the greatest inducements for settlement. Her climate is mild, the soil exceedingly fertile, and produces well—a greater variety of crops than any other State in the Union. Its water courses are of immense value to her navigation and manufactures. Her immense mineral resources added must soon attract capital, if her people see their best interest and unite as one to encourage the greatest possible diversity of employment and interest.

The West has too long already confined her main efforts to agriculture. As a nation, we have hardly entered upon the high road of individual and national prosperity. Missouri must wake up and secure to herself the grand inland centre. *Place one point of the dividers in the city of St. Louis and stretch the other point across the map to the northwest corner of Michigan, or to the extreme west point of Lake Superior, and strike a circle, and you have the exact centre of the world!*—not as it now is, but as it *is to be.* England, Boston, New York and Chicago, and perhaps a host of other places where there is *room* to build a city, will no doubt dispute this; let them do so, it will not change the matter; they will still remain of great importance, but their relation to the grand whole will be changed. The present generation at the West may not wake up to this important fact, but there *is* a generation to come that will, just as sure as the States remain united; let us forget slavery, secession, and all sectional feeling, and look to the interest of the nation as a unit. The writer is crazy, says one; very well, that has been the case with others. Had not Dewitt Clinton and Fulton been crazy in their day, the West would have been to-day the home of the Indian and the buffalo. Let me say, my dear sir, there is not another section of country on this earth, of equal extent, where *all* the elements of national greatness are to be found as they are here. Four of the States within this circle can feed and clothe a larger population than twice that amount of territory in any part of the old world, with less labor. Missouri and Illinois must be the grand centre; St. Louis must become the first city in the Union, and Chicago the second. Their ultimate Union under one city government may sometime depend upon the consent of Peru and Lasalle. Boston, New York and other Atlantic villages must, in time, *go West* to trade, when, as now, the West goes East.

Does any one suppose the West is always to be merely a producing country, when she has more and better facilities for manufactures than any other part of the wide world?

HOME MANUFACTURES AND DIVERSITY OF INTERESTS

are what produce national independence and wealth. Let the farmer and mechanic exchange their less valuable products for their family support, and sell their staple products for cash, and invest it in manufactures, or leave it on good security at a moderate interest, and they need never fear hard times or want. *Home manufacture at the West* is what the farmer wants to secure, a *certain, safe and nearly uniform market.* We *must*, and, sooner or later, *will* have it; this done, and we shall have but little complaint of railroad monopolies. The time may not be distant when we shall have a dozen double-track railroads to the Pacific coast; but free trade will not do it; the West is not the country to cry free trade; the time is not distant when she, of all other sections, will go for keeping our gold at home and sending *manufactures* to foreign ports.

One of the great wants of the West is a market for her products that does not lie so far from her as to require long lines of transportation, and two or three "middle men," or commissions. This want can be supplied only by manufactures at home. It is surprising that all do not see the folly of sending our farm products hundreds of miles to be consumed, when it would be better to send for the *consumer*, and let him become a citizen of the West.

Home manufactures are the main anchor, the bulwark, of national independence. The nearer we can produce all the necessaries of life, the more independent we are.

What a deplorable condition the people of the Southern States were in during the years of war and blockade, for want of manufacturers of such goods as all required. They could not properly arm or clothe their army, and much less their people. The policy had ever been, "cotton must be king," and all other interests must be secondary, and manufactures entirely out of the question. She was led to believe that free trade was for her interest. One great cause of her failure was that lack of independence which the mechanic arts always bring to a nation.

Free trade is one of the wildest suicidal delusions that could possibly curse *this* nation. If it were possible to adopt it, the result would be to paralyze every branch of industry, and beggar the nation. The idea of free trade carries with it the presumption that the only great interest the West can build up is agriculture, when she has more and better facilities for manufactures than any other part of the earth. She can feed a more densely populated country than any other part of the world.

All the elements of national wealth are here. We need not import a dollar's worth of goods from other nations, beyond what they would exchange for our raw material and manufactured goods, whereas now we import more than we export, or, in other words, we buy more than we sell, or, as the farmer would say, we do not raise (or grow) enough to pay for what we buy.

Do the mass of the people understand this question of Free Trade, of Tariff, of Manufactures? If they do they must see that there is but one way to pay our debts and support the (family) government, and that is to take it out of the earth. Statesmen, financiers, are perplexed over this subject. We all want specie payments, and yet go to Europe for more goods each year than we can pay for. The result is, our national bonds go to Europe by millions each month, and our gold and silver are drawn from us to the last dollar. Let the West wake up to her best interests. Let her, in every way, encourage the manufacturer to come to the West. We will feed his operators and him at a less cost than we can while he remains East. We will furnish him with breadstuff and wool without a commission merchant to handle them for him. Our merchants will sell his goods and save to the people who consume them the cost ot transporting them a thousand or more miles. We will save our gold and silver at home to pay off our bonds and greenbacks. We will, in a few years, be able to export manufactured goods in place of money to purchase such articles as we can not produce at home. This will not be done by cheapening labor on the farm or in the work shop, but by the saving of unnecessary cost.

Let the West resolve to manufacture for herself, and the capital of the East would not only *come* West but it would remain here; whereas, now the cash is sent out to purchase our wheat, corn, pork, beef and wool; the farmer pays it into the hands of the merchant *and he pays it back* into the hands of the Eastern man, and there it must remain until our "next crop" requires moving East. So it has been, and ever will be, unless we go in for making our own cloth, boots and shoes, hats and caps, clocks and watches, pins, hooks and eyes, buttons and jewsharps, cordage and fish hooks. Had we a thousand banks in addition to what we have now, they could not keep the money here; for it is the manufacturing and not the banking interest that draws it East.

Diversity of employment is what keeps up the wages of the laboring man. Build no more railroads, and what a multitude of laborers would be thrown upon the farm for employment. The effect would be, first, to cheapen farm labor, and next, to cheapen the products of the farm, as the quantity would be greatly increased; whereas, if we had our thousands of workshops, our millions of spindles, the labor would be absorbed by farm and shop, thus supporting all branches of industry, and neither suffering by a sudden influx of labor.

Why is it that New England is so much more prosperous than any other part of our country? Her soil is poor, her winters long, and the cost of her breadstuffs much greater than here at the West. It is because she furnishes profitable employment for every one who will work. The farm hand hires to the farmer for six months, works his time, and goes into the shop for the next six. The farmer's sons go there also, while the proprietor of the farm cares for his stock of cattle and shop through the winter, prepares the wood for the year, pays off his debts and invests the net proceeds of the farm in manufacturing stock that pays its eight to twelve per cent. dividend and gives employment to his family, and consumes every bushel of grain, every pound of meat, every dozen of chickens and eggs, all his wool and dairy products, his spare wood, and garden, and other products that find no market here at the West. This is why prosperity dwells among the hills and rocks of New England. Massachusetts alone employs 146,268 of her male population in the mechanic arts, while Illinois the empire State of the West, employs only 22,489 of her male population in her mechanic industry. Massachusetts has 1,231,066 inhabitants; Illinois has 1,711,951. The six New England States have 323,434 males employed in mechanic arts. Six Western States, Illinois, Indiana. Wisconsin, Iowa, Minnesota, and Michigan, have only 69,565 employed in like manner. No wonder we go East to be clothed; no wonder money commands ten per cent. West, while it goes begging at four or five per cent. at the East.

The average rate of farm wages per month in Massachusetts is $38 94; Illinois $28 54; in Missouri $26 75.

These figures are taken from Congressional reports.

The writer of this article has no sectional feeling to bias him—his whole country is alike in interest to him; no section no interest, that has the good of the nation at heart but he would assist or defend. The interest of the nation should be like that of a family—all of its legitimate pursuits, interests, and aims should be one. In its deal, honest, frugal, just; *its great aim as a nation, independence.* To secure this to the nation will also carry with it individual prosperity, contentment and happiness. The commercial and financial policy should be fixed. By this I mean, so arranged that all may engage in the various pursuits of life without fear of a political party change that may result in disastrous changes of policy. That policy should be, first, a determination to render the nation, as far as possible, independent of all foreign nations, by encouraging, as far as possible, a diversity of pursuits in business or employment. Next, our currency should be of uniform value and equal in quantity to the absolute, healthy necessities of the country. Our General and State Governments should encourage immigration in order to more fully develop the resources of our country, and to render the products of the soil more valuable, by inciting the mechanic and artisan of the old world to accompany the agriculturist to this our happy land.

The writer of this article has spent much of his time for forty years in traveling in America—in Canada, Mexico, and the United States. He has noticed, with great care, the habits, customs, intelligence, and prosperity of the different sections. To so state the results of his observations as not to offend is no easy task; and yet not to do this we should fail in our object.

We are therefore compelled to say that we have found a greater degree of *general prosperity diffused among all classes* in Massachusetts than in any other State or country. Now, if this is so, should we be jealous of her? Or should we emulate her—seek to place our particular State, that we so much love, above her—not by pulling her down, but by going *up* ourselves? To disgrace our neighbor does not elevate ourself in the eyes of the inpartial judge; but on the other hand renders our defects the more reprehensible.

We now come to inquire why she enjoys that wonderful degree of prosperity. We believe, first of all, it is no little owing to her long-ago fixed State policy: her early stand in favor of free schools, that rich and poor alike should have the advantages of education. Education is power, not only to the individual, but to the State—the nation. It also became her policy to furnish profitable employment for all.

In her early history she was no more prosperous than any other agricultural country. Her people suffered for the want of many of the comforts and conveniences of life; her agricultural products, beyond her own immediate wants found no market. The mother country (England) would not take them, or any other country.

Under the pressure of our national and her State debt at the close of the war of 1815, the poverty and bankruptcy of her people, she turned her attention to manufactures. A part of her people left the harvest field for other employment, thereby becoming consumers of breadstuffs in place of producers. This wise change gave a market for all of her field and garden products. She soon supplied her own people largely with goods of various kinds manufactured among them; this gave an impetus to agriculture heretofore unknown. Villages sprang up along her brooks (creeks) and rivers; soon the farmer could not supply the mechanic with all the food he required; and New York found a market for a part of her surplus farm products in Massachusetts, and in turn the mechanic found a market in New York for many of his wares.

New York caught the idea, and the immortal Clinton projected and forced the Erie Canal into existence, which opened up this, our, of all others, great country, yet to be the centre of manufactures and wealth.

But to return to Massachusetts: there all, as we have said, find profitable employment—summer and winter. Her people are alike agricultural and mechanical. The child and the adult find work. The small boy stitches on the strap of our boot, the larger one the counter, while the father or older brother puts on the bottom. The girls braid our hats (shame on our Western girls—every store in the State should be supplied with our summer hats by them), card, spin, weave and print our calicos, make our pins, hooks and eyes, braid our dress braids and *whips*, all by machinery. It is this diversity of employment that furnishes a sure market for all the farm products of Massachusetts, and renders her prosperous above her sister States. As strange as it may seem, her sister State, Connecticut, only woke up to the importance of adopting the policy of Massachusetts so recently as 1864. In June or July of that year she passed what is known as a General Flowage Bill, with the avowed design of giving encouragement to home industry in a more extended field—the mechanic arts.

Rhode Island furnishes employment to more people than any other section of our country of equal territory.

Missouri should employ State agents, whose business it shall be to furnish *strictly truthful* information, by maps and statistics, as to resources of her soil and mines, and her wants in manufacture. Let those who own water power improve, or dispose of it on more than liberal terms, lay out and build up villages, not by high prices of lots, but by encouraging the mechanic. Missouri is behind her sister States in some respects. She need not be. As we have before said, she *has more natural advantages than any other portion of equal size of this earth*—but she must wake up.

Governor Merrill, of Iowa, estimates that the products of that State will reach, in 1870, 35,000,000 bushels of wheat and 124,000,000 bushels of corn. What says the Governor of Missouri? Remember, Iowa is a new State.

Our American free traders ought to give us *facts*, not theories; we will give them one item. They claim (I believe) England as a free trade nation. In 1851 she imported from the United States 592,583 bushels of wheat, and 1,004,783 barrels of flour. In 1853 she imported 3,574,248 bushels of wheat, and 1,378,065 barrels of flour. Our entire export of all articles into Great Britain in 1851 amounted in value to $95,727,753, on which she collected a duty of $24,391,252 31. In 1853 the entire export was $97,495,948, on which she collected a duty of $30,619,841 70. So much for her free trade with the United States!

It seems that the experience of the people of the United States during the recent internal war ought to put to flight all free trade hallucinations. What could the North have done had she not been a manufacturing people; but dependent upon foreign nations, as free trade would render her, for manufactured goods? She could not have armed and clothed her army, or built, armed and manned a navy which surpasses that of any other nation on earth. Our government must have gone down but for her manufactures. Her *currency* was the great lever power that put and kept the wheels of defense in motion. We possessed no means on earth to have sustained ourselves than that of home manufactures. Had the war been with England or France, *without manufactures of our own*, how helpless we should have been. The condition of the South during that four years of war ought to be a warning to all nations to depend upon home for all that home *can* produce. In the case of the United States free trade must necessarily reduce the price of all farm products, and the wages of the laboring man. Such a result would be inevitable.

It is often said that labor and capital are at war with each other. Is this statement true? Does not the day laborer depend upon capital for his means of support? Does not capital depend upon the laborer to keep itself profitably invested? Were all laborers, who would furnish employment, or where the market for the products of labor were all capitalists? Where the labor to give capital value? What but capital furnishes the means to build our internal and sea going merchant marine, or railroads, and manufacturing establishments; with their millions of dollars' worth of machinery? Or what but capital builds our beautiful villages and cities? But for the laborer capital would be powerless for all these—so many evidences of personal wealth and *national strength* and prosperity.

First, our free school system develops human beings into men and women. *Money is power, but education is a power subordinate to nothing short of impossibility.* Education commands money—seldom that money commands thorough, practical education. Why is it the people of the Old World flock to America by hundreds of thousands? Is it not because they know that here the price of labor soon enables the temperate, industrious man to acquire a home of his own. Our cheap, fertile lands soon become the happy home of the once inevitable landless poor of Europe. They do not find capital their enemy. Who does not see with pride and amazement the wonderful growth of our country? Notwithstanding the immense immigration and wonderful production of machinery for agricultural purposes the price of labor has steadily advanced since 1824—as it was then about nine or ten dollars per month for a farm hand, and never over one dollar per week for female house help, while for the last ten years the price of farm labor in manufacturing districts has been from fifteen to twenty dollars per month, and women's pay has gone up from one dollar per week to two and a half to three.

Let the West, like the East, become a manufacturing center, as she will become when she sees her best interest, and farm labor and products will advance in price, and manufactured products will be furnished at a lower figure and far superior in quality. *Shoddy and sham* will find no profitable investment at the West.

Now, for the sake of free trade, only on our part, are the people of the West willing to sacrifice such a future, such a birthright for the sake of supporting the pauper labor of the old World, especially as they can raise that labor to comfort if it will come to America for employment?

Are the people of the West willing to destroy the sure market they now have in the Eastern States for their hundreds of millions of farm products for the sake of trading in Europe with people who will not take on any terms our products beyond a few millions, unless forced to do so by short crops in her own country?

Free trade is the offspring of a wicked selfishness. Let us illustrate by a plain case. Suppose a family of ten brothers, they constitute a community; each one seeks the prosperity of the whole. The labor of their hands is their support. The homestead is cleared, fenced, improved; soon the joint labor produces more than enough to sustain them; they have no market because they are all producers.

The wives of the ten brothers have managed to clothe all; they have most of the necessaries, and many of the comforts of life, but not the luxuries of foreign countries. They discover that the resources of the homestead can be better developed by different members of the family giving their personal, undivided attention to some particular branch of industry; one manufactures the farm tools, another family the dry-goods, another family manufactures the leather for shoes and harness, another makes them up, while other members take the gold, silver, copper, iron, and other minerals from their created earth house; all are prosperous and happy. The farmer is patronized by all, while each of the others receive such patronage as his particular branch of industry may permit. They are all well off, because they have looked for each others interest as the best interest of the whole. The evidence of their real wealth is the amount of gold and silver they possess, for it is these two metals that measure all values. It is a family heritage, a *national* right to possess. He that seeks to appropriate it to his individual interest, sacrificing thereby the interest of the brotherhood, has committed a wrong, a crime.

The free trader tells the farmer of this brotherhood he can purchase his wares of another brotherhood across the water for less money than he can of his brothers at home. He listens to the delusion. It is true, apparently; but his friends (?) across the water will take only a limited amount of his farm products in payment of his purchase, the balance draws his last gold dollar from him, and yet his debt is not canceled. In vain he proffers his farm products in payment; but no, his friend can get his subsistence from the Baltic sea at a low figure, as labor there is poorly paid. He ships his products to the door of his farmer brethren, thinking to find a *home* market, but no, he finds when too late, the shop shut up, and the once manufacturer now driven to the farm, again a producer as he was in 1816. Low wages, low prices, no sure market, and final bankruptcy and repudiation takes the place of prosperity.

The history of this family would be the history of our nation if free traders could have their way.

Already, thank God, the suffering of "our Southern sisters" during the war has shown them the fallacy of their free trade, anti-manufacture, king-cotton-policy, and factories are springing up among them. They are diversifying interest and labor as fast as possible, thereby securing prosperity to all, and a lasting peace. Let every State seek to establish manufactures if she would secure prosperity to her people.

Properly fostered, our own country can produce all the gold and silver, all the iron and copper, all the rice and sugar, all the cotton and wool required. Texas alone can furnish all our coarse wool. She can never succeed in growing fine wool. The scab of fine wool sheep settles that question. Her best interest lies in wool and wheat, unless she can export her cattle. The Northern States can produce all the fine wool we require. The States of Kentucky and Missouri all the hemp. And the importation of jute should be so taxed by tariff that flax may take its place. Can not the farmer see that already the soil is giving way to the constant cropping by corn? It is corn, corn, with him. Let him petition Congress for a tariff that will protect all branches of industry. Let him pray without ceasing for manufacturing villages and cities all over the land. Let him raise horses, cattle, sheep, and swine, and thereby keep up the fertility of the soil. Let him raise corn and other grain. Let him raise flax and the sugar beet, and find a market for all, as he may if he will, at home, in his own county, at fartherest. Let him do this. Let him banish all free trade notions, and prosperity beyond precedent will be the inevitable result.

Think not because the West has heretofore been tributary to the East she is always to be so. The West wishes the East no harm. She offers the farmer and mechanic a home in the West just so soon as they can see it for their interest to come here.

Illinois, Indiana, and Wisconsin now have the lead of the West in manufacturing pursuits. Little patriotic Iowa pushes hard after them. Michigan is awake, and Missouri is coming. It is now left for Missouri to wake up and assert her right. She must open her arms to immigration, forgetting all differences of opinion that have heretofore impeded her progress, make home safe and happy to all. This will invite capital. Her heretofore undeveloped resources will come to light; her wealth will be doubled as it were in a day; and as sure as "time and tide waits for no one," she will become the Empire State of the West. We bid our sister States God speed; *progress* is from this time on the watchword of *Missouri.*

SOUTH MISSOURI AS A PEACH GROWING REGION.

BY J. VANCLEVE PHILLIPS.

The writer, in 1857, bought thirty bushels of peach stones in Franklin county, Missouri, and shipped them to his brother in the central part of New Jersey. This was done from the fact that peach trees in New Jersey were early attacked with the "yellows," and in Missouri the trees were healthy, and the native fruit of almost equal size and flavor as much of the grafted fruit East. These pits were planted in a nursery, and I was there the second year following, when they were up thirty inches high, half the nursery being Eastern pits. The line between the Eastern and Missouri pits was distinctly marked, the Missouri trees being a dark healthy green, and trees from the

Eastern pits ten inches shorter, and showing that at that early age they were affected by the "yellows." My brother sold a large part of the trees from the Missouri pits and set out ten acres in an orchard.

The shipping of these pits East and seeing the trees after they had grown, and knowing the price of peaches in New York and St. Louis the last ten years, as well as a study of the soils both east and west where peaches are grown, has given me a general knowledge of the growing of orchards, and leads to the conclusion that Missouri has great advantages over New Jersey for investing labor and money in peach growing.

The remark is frequently made that St. Louis now has more peaches grown near it than are needed to supply the market. The same remark was made of New York City twenty years ago, and was true, yet it has been found east that the more peach orchards set out and more peaches produced the higher the price; and the same remarks will hold good in reference to St. Louis, and it is explained in this way; Twenty years ago, when the amount of peaches shipped to New York was but a fraction of what goes there at present, the commission men had not considered the business of sufficient importance to invest much capital or energy in developing it. Yet as the amount of peaches increased more capital was drawn into the purchase, and correspondence opened through all the New England States and Canadas; and the amount consumed in the city was but a fraction of the amount shipped to tributary towns and cities. The development of the railroad system was the groundwork of this distribution.

Just as soon as there are two or three hundred large peach orchards set out along the lines of the Iron Mountain and Southwest Pacific railroads, and ten or twenty car loads of peaches arrive daily at St. Louis through the peach season, the business will be of sufficient importance to attract energy and capital to distribute the fruit. The completion of the North Missouri, Cedar Falls, and Minneapolis railroad will open up a great outlet for peaches, apples, and grapes from St. Louis. Central Iowa is filling up with large towns, and they will need and be able to pay for a large amount of fruit.

In reference to the soils for peach trees, I will say that I have examined some ten counties in Southeast Missouri, and noticed the growth of vines, peaches, and apples. Considerable portions of these counties have the elements in the soils, altitudes, and other conditions, of first class fruit lands.

The writer in 1858 took ten barrels of golden pippin apples from a small tree near Sandy Mines, in Jefferson county. The apples grew in clusters and had weighed the limbs down so that they lay several feet on the ground, and the tree from a distance looked like a weeping willow with its branches sweeping the ground. The finest development of the natural peach was seen in this neighborhood.

The country is silurian limestone interstratified with sandstones, and the soils formed of the decomposition of these rocks. The timber is a rather small growth of white and black oak on the ridges; and sycamore, elm, and other soft wood along the streams. The surface of the rock is uneven, and deep red clay covers the ridges. This red color is due to the oxide of iron. Peaches, grapes, cherries, and other stone fruit can not be grown permanently except in soils where they can get a full supply of oxide of iron as food to perfect the seed. A lack in this element causes defects in the seed, and mildew and blight.

The precise manner in which plants get their supply of food is not fully understood. We must suppose that the vital forces of a peach tree are somewhat analogous to the human system; that a continuous supply of elements necessary to build up the tree is needed, that the old elements are continually becoming effete, and are thrown out through the various avenues of the plant or system, and are replaced by new elements; that the thousand little *spongioles* or mouths of the roots of the tree, as they press out through the soil, take up particles of lime, sand, and the carbonates and oxides of iron, and that these by the gastric juices in the mouth of the plant are chymified, or reduced to such a condition that they can be taken up in the circulation of the plant; that they are carried to the lungs or leaves of the plant, there brought in contact with the oxygen of the atmosphere, and reduced to a suitable condition to be used to build up the structure of the plant.

The disputed point at present is, whether the food is received by the *spongiole* in a solid form must first be reduced to a solution with water. It has been shown by pulling the bark from limbs at the different months in the year, that when pulled the 16th of June in this latitude a perfect new bark will cover the place, and that the new bark commences to grow from the upper end of the limb, showing that the food of the plant must be carried from the *spongiole* to the pores of the leaves and returned before it can be used to grow new bark.

In the study of the fruit capacities of a district three things are to be considered,—latitude, altitude, and elements in the soil. If the soil is rich and clay deep and pale colored, the trees will grow rank, but leaves be liable to blight, and fruit to mildew and rot.

In New Jersey peach orchards twenty years ago were planted in sandy districts. They did well for a few years, but the elements in the soil necessary to supply the tree with food were all taken up in a few years by the growth of the trees, and the orchards died out.

These lands were in the south part of the State. The new red sandstone extends through the central part of the State, and overlying clay comes from the decomposition of this rock. This district commenced to be planted about twenty years ago, and the "peach fever" among the farmers carried the orchards generally through this sandstone district, and it paid well, yet the orchards were short lived,

—three bearing years being the average life. Through this sandstone country cross ridges of trap rocks.

The choice peach lands, where the trees grew the most thrifty and orchards were the longest lived were along the sides of the low mountains where the trap rock was largely decomposed, and had thrown down quantities of the oxide of iron. The sandstone was highly charged with iron, and the overlying clays also; yet the covering of clay over the rock was generally shallow and lean in elements (lime and humus) to sustain the growth of the tree for any considerable length of time.

In Illinois, where the formation is what is called "drift," i. e., sand, clay, and pebbles, this being from twenty to fifty feet deep, and covering large tracts in the central part of the State, peach trees will be short lived.

In St. Louis county, where the soil is rich and deep and the subsoil pale colored, such as is seen in the cuts in the brickyards about the city, the trees will grow rank, yet fruit lack strength and flavor.

The same remarks apply to grapes. The Cincinnati, Kelly's Island, and Indianapolis grapes and wine, have less flavor than the Missouri. The Missouri Catawba is called a "rough wine" from the fact of its high flavor, yet this proves the strength of the wine producing elements in the soils in Missouri.

In planting peach orchards the pits should be planted twelve feet apart, and the trees grown from the pits direct. In transplanting trees the tap root is always cut off; and this being done, the proper growth of the tree is never fully restored. This is one of the causes of the short lives of peach orchards.

The uplands of Jefferson, Franklin, and Crawford counties, Mo., are first class peach growing lands. It is believed that orchards raised direct from the seed in these counties would live double the average life of peach orchards and prove a large paying investment.

These lands are generally covered with white and black oak timber. In preparing these lands for peach orchards this timber should be cut and made in rails and cord-wood, tops burned, and then when the ground is well saturated with water, a stump machine used and stumps pulled up, and ground broken up deep with a heavy ox team. This being done, the stones are planted and marked, and when up grafted with choice varieties of fruit.

A party planting from ten to one hundred acres in an orchard on lands as stated, may expect to be paid fully as much for his time and labor, say taking ten years, as farming the richest prairie lands in Illinois, and with much less labor. An orchard of seventy acres on the Illinois Central Railroad is said to have paid $20,000 the last year.—The same results may be reached in Missouri. These lands rate from $2 to $5 per acre, and peach growing is a branch of industry that needs to be developed on a large scale in this State. Peach growing is one of the choice departments of husbandry, and the production of fruit on a large scale, so that all classes of the community can afford to use it, will prove a permanent benefit, both to the physical as well as moral status of the citizen.

MISSOURI AS A WOOL GROWING STATE.

The following article appeared recently in the *Rural New Yorker.* It was written by Dr. Henry S. Randall, the best authority in this country, probably, on the subject of Sheep husbandry:

"We have repeatedly, in answer to inquiries in regard to the best wool growing regions of our country, expressed a highly favorable opinion of Missouri. This has brought upon us a multitude of more specific interrogatories, concerning its climate, soil, face of the country, productions, price of land, water, healthfulness, etc., etc., and concerning the best locations in the State for wool growing on a larger or limited scale.

We must apprise our readers at the outset, that we have never personally visited that State. The knowledge we possess concerning it has been collected chiefly from emigrants, travelers and western flock-masters, who have driven their sheep into Missouri for cheaper keeping. Among our informants are various gentlemen of observation and candor, and of intimate experience in sheep husbandry; and we regard their information as reliable as any which can now be obtained—far more reliable than can be obtained from such inhabitants of the country itself, as are not specially acquainted with sheep husbandry.

The climate of Missouri occupies a happy medium between extreme heat and cold. Its northern half corresponds in latitude with Southern Illinois, Indiana, Ohio and Northern Virginia; its southern half with Kentucky and Southern Virginia.

For the present purpose, we shall divide the State into three regions: 1. The northern, lying north of a line extending west from St. Louis to Jefferson City, thence due west to the western boundary of the State. 2. The southeastern, bounded on the north by the above line, and extending from the Mississippi to a north and south line from Jefferson City to the southern boundary; and 3. The southwestern, occupying the remainder of the State. In briefly characterizing these three regions, we do not, of course, expect to give a description of either, which will apply to all the lands embraced in it. There must be a multitude of local and even extensive exceptions to any general characterization.

The northern region possesses a fertile, often an exuberantly fertile, soil, and is an admirable stock growing country. But we need go into no details concerning it, for our present object, because it does not, according to our best information, afford superior advantages for wool growing to Southwestern Missouri, apart from the question of climate; and the latter has a material advantage in climate, inasmuch as its winter and foddering season is shorter.

Southeastern Missouri is rough, and often mountainous; and much of it is covered with natural forests, which must be cleared away before it will supply pasturage.

Southwestern Missouri is generally a prairie country, though the Ozark mountains, or hills, cover from one to two tiers of counties on its southern extremity. Possibly a tier of counties on the east of the territory we are describing may be more or less mountainous; we have not particular information on that head. But the remainder of it, embracing a tract of about one hundred miles square, is chiefly rolling prairie of the finest description. The "Spring River Country," as it is termed—in the southwestern portion of this hundred mile square—including the counties of Newton, Jasper, Lawrence, Barton, Dade, etc., is described to us by an eminent Illinois farmer and wool grower, who has examined it, as a superb farming and grazing region—as a land possessing about as many natural advantages as any the sun shines on. The rolls or waves of the prairie generally rise from twenty to fifty feet—giving a good drainage. The soil is loam, and is occasionally sandy. It is as fertile as the choicest lands of Illinois—which is surely saying enough for it. The prairie grass is usually thick and fine, and often yields two tons of cured hay to the acre. Spring river, the main western branch of the Neosho (a tributary of the Arkansas), is a clear, swift, rocky stream; and a number of its affluents have the same character. There are some springs, and occasionally, fine ones. Altogether the country is well watered, for a prairie country. The streams are skirted with sufficient timber for building, fuel, and fencing the necessary amount of grain land, in other words, this region is about as well timbered as Illinois, Kansas, Iowa, etc. The Osage orange flourishes, so that any amount of fence is attainable. There is plenty of building stone. Wells are from sixteen to thirty feet deep. The water is good.

Polk county, lying immediately east and a little north of the preceding group of counties, is the centre of a region where many sheep have been introduced from Illinois—driven from the latter to obtain more abundant and cheaper pasturage. We recently conversed on the subject with an eminent wool grower of Illinois, who has a thousand sheep in keeping in the above named county, and who is intending to send many more there. Last year his thousand sheep subsisted entirely on prairie grass, from the 12th of March to the 15th of November. Two or three heavy frosts usually occurring at about this period kill down the wild prairie grasses, so that foddering commences considerably before winter sets in. This four months' foddering would be abridged from six weeks to two months if "tame grasses," capable of resisting the frosts were introduced. Southwestern Missouri lies in the exact latitude of the famous Kentucky blue grass, and no dou is entertained by those best acquainted with the subject, that this grass will flourish in unbounded profusion throughout the whole of it. As it now is, sheep are wintered on prairie hay and corn—the former to be had for the cutting—the latter, when bought, costing from 25 cents to 40 cents per bushel in currency. Sheep are foddered abundantly with corn, and in four months consume about two bushels per head. Sheep are not sheltered in winter in any part of Southwestern Missouri, nor indeed are any other domestic animals except work horses.

The preceding description, with some exceptions, apply to the great portion of Southwestern Missouri. It is a land of fertility, abundance, and utilitarian beauty. Choice unimproved land fetch from three to eight dollars an acre; improved ones from five to fifteen dollars. The "improvements" usually consist of a good log or small framed house, stables and inclosed fields, which have been broken up for grain. The most common price for improved farms is six, eight or ten dollars an acre, and the very highest price of those which are for sale at all, is about twenty. The owner of a farm can ordinarily pasture a large amount of uninhabited wild land about him—and this condition of things will continue many years. The country is well adapted to wheat, corn, oats, etc., quite as well as Illinois. Among our informants we have found none who describe it as unhealthy, or particularly subject to any fatal disease.

[From the U. S. Agricultural Report.]

AMERICAN WINE AND WINE-MAKING.

BY GEO. HUSMANN, HERMANN, MO.

No other branch of agriculture or horticulture has of late attracted so much attention as the subject of grape growing. Almost innumerable varieties have sprung up and been disseminated, each claiming some superior merit over all its predecessors, until the public mind has become bewildered, and those who wish to enter into the delightful occupation of grape growing are at a loss what to plant. Difficult as the task may be, to choose from among the many, yet the choice will become comparatively easy if a few points are duly considered; and I will try and elucidate them in a few remarks, afterwards giving my views about American wines, and how they should be made, summing up with a description of some of the most prominent varieties, and their value for wine.

Let me here remark that it is with a great deal of hesitation I undertake the task of writing, at this early phase of our development of this great branch of industry, what must be, at best, but local experience. I do not claim infallibility, and am fully aware that many of my remarks will be severely, and perhaps justly, criticised; but I may claim that I have given the subject close attention for the past sixteen years, have labored hard and earnestly, experimented a great deal, and it is experience, the results of these experiments, which I give here, not mere surmises, formed under the hasty impressions of casual observations.

The starting point from which we should look for all the results to be attained, may be summed up as follows:

1. Grape-growing, especially with a view to wine-making, is a purely local question, and only such varieties may be chosen for a certain locality as will attain their greatest perfection there, and are as free from disease in the locality as can reasonably be expected.

2. A grape, to make the best wine the variety is capable of making, must be perfectly ripe, not merely colored, for only when fully ripe does it attain that delicacy of flavor which will always distinguish the product of a good locality from that of an inferior one.

3. The time will come, in this country as it has long since in Europe, when the difference in quality of native wines will be fully appreciated, and when those who produce the best will get four times the price for it which others will realize for an inferior article.

4. No careless man need attempt the business, for he will surely fail. To make a really good wine and to take care of it properly after it is made, requires great industry, extreme cleanliness, careful and incessant watching, and a critical taste, which will enable the operator to judge of the quality of the material he has to work upon, and the exact time when it should be racked, handled and bottled.

Now let us look at these several points a little closer. First, in regard to the locality for each grape. A recent visit to the East, on which I tasted many samples of wine made there, has forced the conclusion on me that it was entirely useless for them to try to make a first class Catawba, such as we can make here. And why is this so? The reasons are apparent. The Catawba, although it may color in Pleasant Valley, Crooked Lake, or Northeast, does not get perfectly ripe. Its acid center does not dissolve, it does not develop the delicacy of aroma which the perfectly ripe Catawba possesses, and consequently the wines are acid, harsh and have but little flavor. The same holds good in regard to the Concord. The latter colors with us the beginning of August, and yet we do not attempt to make wines from it until the latter part of September. The Catawba colors here about the middle of August, but those who intend to make a really good wine do not gather their Catawba grapes until the 10th of October. The longer a grape hangs on the vine the more its watery substance evaporates, the acid diminishes and the sugar increases. Therefore it is that all Catawba wine made at the East has an unripe taste, and but little flavor. They should, for wine, confine themselves to such early ripening varieties as the Delaware, Creveling and Rogers

No. 3. Of these I am sure they could make a good wine, instead of the miserable apology for Catawba, Isabella and Clinton, with which they now flood the market, and which requires a large fund of local patriotism to assist in its consumption.

Not even the Clinton, although it colors early, will make a good wine unless allowed to hang late, as it requires a longer season to ripen than they have in the section named. It is a well-known and established fact in Europe that the temperate zones will produce the highest flavored wines. Neither the North nor the South will furnish them, although the latter will produce wines of good body (for instance, Sherry, Port, the different Italian wines, etc.), they lack that delicate fragrance, that exquisite bouquet, which has made the fine German and French wines the universal favorites of the civilized world.

And in this country the same rule seems to apply, for among a very many California wines tasted, I have not found one which was of really fine flavor, although in one or two instances they were of very fair quality. The hot and arid climates of California and Mexico do not seem to develop the bouquet requisite in a first class wine; and although they may make a great quantity, in quality they will not be able to compete with the West. "Westward the star of empire takes its way," and Missouri, Illinois, Arkansas, and perhaps parts of Indiana and Ohio, will produce the wines which alone are destined to be the pride and boast of this nation.

Already have our Norton's Virginia, Cynthiana and Herbemont become famous; and in a few years we may boldly throw down the glove to Johannisberg, Steinberg, Chambertin and Chateau Queen, and challenge them to produce better wines than our cellars will furnish.

Therefore the grape grower should only select such varieties, with a view to wine-making, as will fully ripen in his locality; but they should also be perfectly healthy and free from disease in any form. Not only does the fruit from a healthy vine make a better wine, but it also makes a great deal more; and only when the wine-maker can count upon a sure return every year will his vineyard and cellar warrant all the outlay of capital, labor, skill and nerve which are required to make him successful. A grape may be ever so good, make an excellent wine, and yet it will never become popular nor be extensively planted unless it is also healthy. Only from healthy varieties, those which yield a certain return every year, we can make wine so cheap that it will become the beverage of the masses. If we can count upon one thousand gallons to the acre per year, we can afford to sell that wine much better at 50 to 75 cents per gallon than we can sell wine of a variety that yields but 250 gallons at $1 50. The labor is nearly the same and and the capital it yields is larger.

We want wines, good wines for the laboring classes, at low figures, and of these we should grow the greatest bulk.

We also want choice wines for the fastidious in taste, those who are able and willing to pay a high price for a luxury; but the choicest wines will always be restricted to certain and limited localities. Both objects can be easily attained, but every one who strives after the utmost perfection will have to experiment a great deal, and he need not think that his experiments will all be successful. Only by long practice can he acquire the critical taste and nice judgment necessary to make the best of the material he has to work with.

Wine-making is an art, and is not acquired in a single season. Grapes have different qualities and require different treatment to convert them into the best wine they are capable of making.

After these preliminary remarks we will look at the operation itself.

GATHERING THE GRAPES.

As already remarked the grapes should be thoroughly ripe. The best indicatious of ripeness are: the stem becomes ripe and woody, and begins to shrivel; the berry begins to shrivel around the stem, the skin becomes thin and transparent, and the juice becomes very sweet, sticking to the fingers like honey or molasses, after the grape has been handled for some time. If any bunches are backward in ripening, as is often the case, the ripest are gathered first, and those that are not fully ripe remain on the vines. They will ripen much quicker after the ripest have been gathered.

The stems should be cut close to the bunch as possible, as they contain a great deal of astringency, which is apt to make the wine rough. All unripe, rotten and deficient berries are carefully picked out, and none remain on the bunch but those which are perfectly ripe. Generally the gatherer carries two pails, and the unripe berries are thrown into one for a wine of inferior quality. Space will not permit me to describe all the implements used in wine making. Those wishing further information about them are referred to my book, "Grapes and Wine," where they will find them described. I will simply name them here: Pails for gathering grapes; wooden vats for carrying them out of the vineyard, either to the wagon or to the press direct; the grape mill, with either wooden or stone rollers to mash the berries, fermenting tubs or vats to receive them after mashing; the press casks of various sizes, and a good cellar, divided into compartments—the fermenting cellar, which should not be too cool to facilitate fermentation, and the cellar for ripening and keeping the wine, which should have an even temperature of about forty-five degrees in summer and winter.

The temperature of the fermenting cellar may be, at the time of wine-making, about 60 degrees.

To make white or light colored wines, of delicate flavor and smoothness, the grapes should be mashed and pressed as soon as gathered. The Catawha, Herbemont, and Rogers' Hybrid No. 1 especially require this treatment.

The skin of the Catawba contains a great deal of tannin, as do the stems and the most delicate Catawba and Herbemont wine is made by pressing the grape without mashing, and keeping the rum separate from the after first pressing. In this way a white wine can be made of the Concord, but whether this is an improvement is still a mooted question. I think not; the wine made by this method of the Concord, is to my taste insipid, and the Concord is evidently a grape for red wine, a wine resembling claret, with less astringency, and lacks character if treated in the above manner, although it should not be allowed to ferment in the husks more than 24 hours, as its flavor will become too fiery and the wine too harsh.

It is here where the question may most properly be asked: Shall the must be left as nature made it, or shall sugar and water be added? This question has of late called forth a good deal of discussion, one party claiming that nature makes the wine, and the juice of the grape should be left just as nature gives it without any manipulation or addition whatever. The other, that nature furnishes the raw material, but that wine is an artificial product, which requires all the skill, guided by reason, of which the maker is capable.

The latter is evidently the most reasonable view. My ideas about this question may be given in very few words. If nature furnishes me in the grapes which I intend to make into wine, a juice containing everything to make first class wine, in the right proportions, I shall leave it so, on the principle, "Let well enough alone;" but if I think there are deficiencies which can be supplied by adding to that which is already in the must, but not in sufficient quantity, I shall do so as my reason was given me by an all-wise Creator for the purpose of using it to the best advantage.

All grape juice contains, in larger or smaller proportions, sugar, water, free acids, tannin, gummy and numerous substances, coloring matter, and fragrant or flavoring substances. A good wine should contain all these ingredients in due proportions. The saccharometer will show me the amount of sugar contained in the must; the acidimeter the amount of acid it contains. If I find that the must does not contain sugar enough, and an excess of acid what can be more natural than to add the sugar and to dilute the acid by adding water? Both are ingredients of the grape; where, then, can be the harm in adding them, until the proportion is attained? But this is not all. Many of our native grapes contain an excess of aroma, as well as an excess of acid. If, by a proper manipulation this also can be toned down, so as to be pleasant instead of offensive, it is an improvement, not an adulteration, and such a wine is certainly just as pure and more wholesome than the pure juice of the grape, with its excess of acid, tannin, aroma, would have been.

In short, in all the manipulations during the process of wine-making, the operator must have an ideal standard in view, the utmost perfection that can be attained from the variety he has to deal with, and must try to bring his must up to that standard.

The process of adding sugar and water to deficient must is called Gallizing, after its most successful and strenuous advocate, Dr. Gall, and extracts from his works have already been given in former volumes of these reports, to which I would refer the reader for much useful information.

But there is a method still of using the husks of the grapes, after the first gentle pressing, to much greater advantage than can be done by distilling, which is called, after the inventer, Chaptal, Chaptalizing.

It has been the custom in France, after pressing the grapes as dry as they can be pressed, to give the husks to the servants and laborers, who would add water, let it ferment a few days, and thus make an inferior wine, which they used as a common drink. Mr. Chaptal investigated the matter closely, experimented, and found that by pressing the first time only two of the wine-making ingredients were exhausted, namely: sugar and water, and that the husks still contained an abundance of acid, tannin and flavoring—in short, all the ingredients to make wine, except sugar and water. This once established, what could be more natural than to add these and make, so to say, another edition? The experiment was tried and succeeded beyond expectation. Mr. Chaptal even contends that it can be repeated several times, and that even the third repetition will make a drinkable wine, one in quality very little behind the first.

If we apply the practice to American wine-making, we find the result very gratifying. Our native grapes are nearly all so abundantly supplied with flavor and tannin, that the Chaptalized wine is very little, if any, inferior to the first pressing. Of course there is in this, as in everything connected with wine-making, a wide difference in varieties. But there is a limit to everything, and I would certainly not endorse third, fourth or fifth editions; but if, after pressing and perhaps proper Gallizing, the wine-maker finds that the husks still contain an abundance of wine-making ingredients, and that only sugar and water have been exhausted, I can see no reasonable objection to making another edition, especially when it is kept separate from the first.

I have done so repeatedly; have even made three different classes—pure grape juice, such as was Gallized by adding one-third water and sugar, and another which was only sugar and water fermented on the husks. I have placed the three wines before good judges, told them of the difference of the making, and asked them to pick out the pure juice. In nearly every instance were they unable to do so, but the majority agreed that the Gallized wine was the best, the Chaptalized next best, and the pure juice, although good wine, not as agreeable as either of them. This was Concord, and of course we must modify the treatment according to the variety and the season we have to deal with.

And above all let us be strictly honest in this matter. Let the purchaser know what he is buying if he desires it, and let the best wine according to his taste, bring the best price.

As before remarked, in no case do I add anything foreign to the grape, seeking only to supply nature's deficiences, and I do not follow it to half the extent it is followed in Europe. Only since Gallizing and Chaptalizing have become so universally popular, has European wine become so uniformly palatable and cheap. Only since this practice was generally introduced do they produce drinkable wine in all seasons, which formerly they could not do.

Let the reader not misunderstand my position. We can only make the best wine in the best seasons. We can add the sugar to the product of poor seasons, and dilute the acid by water so as to bring the must to its normal alcoholic standard; we can thus always produce a pleasant and drinkable wine, but the exquisite flavor developed in the grape in the best seasons, we cannot make. This is in the hands of Him who alone sends rain and sunshine, and from whom comes all good and perfect gifts. Art can do much, but not everything.

The better the season, the more perfect the grapes, the less will they bear of Gallizing and Chaptalizing, because they do not then contain the abundance of acid which will bear diluting; thus it is that it costs much more to produce the very best wines than wines of a medium or inferior quality. Consequently, in justice to our grape growers, the practice of paying the same price, or nearly so, for all our wines, should cease. An extra quality of Catawba, made from the very pick and prime of the vineyard, with the greatest care and labor, and by leaving the grapes on the vines until the watery parts have evaporated, and of which, consequently, much less has been produced per acre, should be worth treble the price of a wine made from the general run of the vineyard, when the grapes were hardly colored.

It is an injustice to the vintner who produces the best, by a combination of skill, labor, and superior location, and by great loss in quantity, to ask of him to sell such a wine for only a slight advance, say 25 cents per gallon, over miserable trash, hardly worth the name of wine. In Europe this is well understood.

The "Auslese" of the German vineyardist is appreciated and paid for accordingly; why should it not be so here?

Let us encourage home industry; let those who are willing to pay $3 to $4 for good Rhenish wine pay only half that price, or two-thirds, for a native wine as good, and they will soon have wines that will meet all the requirements of the most fastidious taste. But "far-fetched and dear-bought" seems to be the rage, and as long as our own products, even if equally good or better, are left in the cold, and foreign productions bought at extravagant prices, not because they are better, but because they are imported, we cannot hope for a thorough reform.

GRAPES IN 1868, IN THE VICINITY OF HERMANN, MO.

BY GEORGE HUSMANN.

The summer of 1868 was exceedingly dry, so much so, that in some locations the vines suffered severely. This season of drouth was succeeded by a month of extremely wet weather in September, so much so, that it caused some varieties to burst their berries, and the crop of Concord especially, was somewhat damaged. But take it all in all, we think that the vintage of 1868 will be a very useful one; the wine is of average quality, and promises to be fit for use much earlier than the vintage of 1867, with its extremely rich grapes, and heavy must. But we will let the varieties pass muster, as they showed themselves this season. If grape growers in various localities will give their experience with the different varieties in each season, we might learn very much from each other, and the public would be greatly benefited by the aid thus rendered in choosing the best varieties for different locations.

Adirondac.—Although a good grape in quality, *when you can get it*, we confess we have not been lucky enough during our trial of the last five years, to obtain a good bunch of it. A slow grower and a still slower bearer *here.*

Allen's Hybrid.—Very good in *quality*, and, on account of the dry season, it had better bunches than usual. It is apt to mildew and rot, and cannot be recommended for *general* culture, though it is worthy of a place in an amateur collection.

Anna.—Not worth planting here, unhealthy and feeble.

Alvey.—Very promising in deep soils, rich river bottoms, etc. Excellent in quality, and will make one of the best red wines, but is apt to drop its leaves on southern slopes.

Arrott.—Very similar to Cassady, but not quite as good, nor as handsome a bunch.

Baxter.—Very large bunch, late in ripening, but may be valuable as a *wine* grape here and further south. Healthy and productive. Needs further trial.

Blood's Black.—Always a full crop of very neat, compact bunches, of fair quality, somewhat better than Hartford, and ripens a few days later. Would pay well as an early market grape.

Concord.—A very abundant crop, as usual. As mentioned before, the crop suffered somewhat from bursting of the berries, but still yielded a very abundant harvest, which promises to make a very good wine.

Creveling.—This grape has not, in our opinion, received the attention it deserves as a *wine* grape. Here, it always bears abundantly, is a medium grower, may be planted 6 by 6, on northern and north eastern hillsides, and makes an exquisite claret, intermediate between the Concord and Nortons in body, and superior in flavor to either. Very fine this season.

Cassady.—Another very good wine grape, which prefers northern slopes.. Especially fine this year, not subject to rot or mildew, but will drop its leaves on southern slopes.

Clara.—Very fine for table, but rather tender for *general* culture. No amateur collection should be without it. Requires protection in winter.

Clinton.—Suffered somewhat from late frosts, as it is one of the first to bloom in the spring. Makes a good wine, intermediate between Concord and Nortons. An exceedingly rank grower, foliage subject to the attacks of the gall fly. Produced well in some vineyards, in others hardly anything. Requires a good deal of room, and spur pruning on old wood, to bring forth its best results.

Cunningham.—A *very* valuable grape for southern slopes, in this latitude and further south. As usual, healthy and productive, where it had been covered in winter; ripens late, and requires *here* protection in winter to secure a crop.

Cynthiana.—Very fine again; produces a red wine superior to Nortons, always healthy, hardy and productive, makes our best red wine, but is very hard to propagate. Several spurious varieties have been set out under this name, and the public should be cautious of whom they buy.

Catawba.—This has done better this season, than ever since 1857, owing, no doubt, to the very dry season. A very heavy crop of fruit of fair quality.

Delaware.—Has produced very satisfactory results this season; but should be planted *here* in deep, rich soil, on North, East and Eastern slopes.

Diana.—Has done better than usual, but still far from satisfactory. The friends of this variety claim that it does best on poor clayey soil.

Devereaux.—Where this grape will succeed, it is no doubt one of our best wine grapes. Our Southern friends especially should try it. It is somewhat subject to mildew, but succeeded admirably with us this season, and produced an exquisite wine. An *Aestivalis* for southern slopes.

Dracut Amber.—Always succeeds well, but we confess that it is too foxy for our taste, and should be discarded, when so many better varieties can be grown.

Ewing's Seedling.—The admirers of the Isabella, (to whom we do not belong), will find this an improvement on their old favorite, as it is an immense bearer, ripens more uniformly, and is of somewhat better quality. Always healthy.

Excelsior.—A seedling from Louisville, Kentucky. Worthless here, a shy bearer and of poor quality, with not a single good feature to recommend it.

Garber's Albino.—Good in quality but deficient in bunch or berry. Unproductive.

Golden Clinton.—Similar to Taylor, but a very shy bearer. Can hardly be recommended here.

Hartford Prolific.—A very good crop, and, for those who grow grapes for early market, is is one of the indispensables, as it is hardy, healthy, early, and very productive. Can hardly be recommended as a wine grape, though fair wine may be made from it.

Hermann.—This new seedling of Mr. Langendoerfer promises to be a valuable acquisition for this and more southern localities. It is hardy, healthy and very productive, and promises to make an American Madeira. For more northern locations, it would very likely be too late, as it is a few days later than Nortons.

Herbemont.—Has produced a splendid crop again, for those who have gone to the slight trouble of covering their vines. One of the best and most reliable, for our southern hill sides, and will be a mine of wealth to our southern States.

Hettie.—Has proved unproductive, and entirely unworthy of culture with us so far.

Huntingdon.—Has also been disseminated as *Australian.* It is a true native, of the Cordifolia class. Healthy, hardy and productive, very early, resembles Clinton somewhat, and may become valuable as a wine grape, and *only* as such.

Iona.—Produced better bunches than usual, although it suffered somewhat by rot. Ripens very unevenly, and we cannot recommend it, although it is a grape of better quality than Catawba.

Israella.—Also rotted less than usual, ripens about a week later than Hartford Prolific. We can see nothing in this grape which should induce its general culture *here.* It is *only good,* not first rate; not equal to Creveling, which ripens at the same time, and is healthier and more productive.

Ives' Seedling.—Four years old vines of this variety produced a very full crop for the first time. It does not seem to be an *early* bearer, but to bear profusely when older. Fruit very indifferent in quality, perhaps less foxy than Hartford, to which vine and fruit bear a very close resemblance. We have tried hard to discover the many excellencies which our Ohio friends claim for it, in the fruit and wine; but although we have tried at least twenty samples of the latter from Ohio, and some made in Missouri and Illinois, we cannot make anything more out of it than a fair claret. The best sample we have yet tasted, was made by Mr. Conrad Eisenmeyer, at Summerfield, Illinois. What induced the committee to award this the first premium of the Longworth prizes, as the best wine grape for general cultivation, of our whole country, we are at a loss to imagine, as it has hardly been fruited outside of Ohio and Kentucky. In our opinion, it is not as good as the Concord here, either for wine or for the table.

Logan.—Hardly worthy of cultivation, although healthy and productive, as the bunch is too loose, and the quality below par.

Louisiana.—Excellent, in quality, and always makes a fine wine, but is somewhat subject to mildew in some locations, while in others it is perfectly healthy.

Lenoir.—Very good in quality, but *very* unproductive. Not worth cultivating here.

Maxatawney.—Healthy, hardy, productive and of the finest quality *here.* It ripens early enough for us here, and makes an excellent white wine, mixed with the Martha.

Martha.—Did very well again, and promises to be *the* white grape for everybody, as its parent, the Concord, has proved among the black grapes. It is not subject to any disease, as far as we know, but it also suffered somewhat from bursting of the berries, and should not be allowed to hang too late. It has again made an excellent wine, especially if mixed with Maxatawney in equal parts. May *here* be safely recommended to every one.

Mary Ann.—Very early, and very productive, as usual. For those desiring a *very* early market grape, this can be recommended, as it ripens four to five days earlier than Hartford, and is a better looking bunch.

Norton's Virginia.—A very good, regular crop, as usual. It is as reliable as anything we have, but has made its reputation already, far and near, so that nothing further need be said of it.

Northern Muscadine.—Always healthy and productive, but very foxy, and drops from the bunch. The time when grapes of its class were acceptable has gone by, we hope, never to return.

North Carolina Seedling.—A very full crop of large, handsome fruit, not subject to disease, and a good market grape. The initiated can also make a good Muscatell wine of it. Ripe a few days before the Concord.

Ontario.—We think this identical with Union Village. The vines are somewhat tender, and the fruit often ripens irregular. Should not be cultivated, we think, where Rogers Nos. 4 and 19 can be grown, as they are of much better quality, and just as large and handsome, also much more productive.

Perkins.—As usual, healthy and very productive, though foxy. For early marketing, this is desirable, on account of its pretty lilac color, and, as it ripens as early as the Hartford, it will form a very pleasing contrast with this.

Pauline.—Does not seem to succeed here; mildews badly, and is very unproductive.

Rebecca.—Of good quality, as usual, but too poor a grower and bearer to be recommended, except as an amateur's fruit.

Rogers' Hybrids.—These are gaining in favor rapidly, and from among them we may yet expect to get some of our most valuable grapes. So far, only one of them, No. 15, has shown any disposition to disease. All the other numbers we have fruited, so far, have been healthy.

No. 1.—Here, a *very* valuable grape, as it bears profusely, has shown no sign of disease, and ripens its handsome fruit perfectly. It would be a very fine late market grape, as it is already good when the berries are yet white, and looks then much like the white Malaga. It also makes an excellent white wine, and is altogether a desirable grape for our latitude.

No. 2.—Also very good, large black berry, perhaps more desirable as *wine* grape than a table grape, as it is highly aromatic, and somewhat tart and astringent.

No. 3.—Very fine, ripens as early as Delaware, and, we think, as good in quality, but the berries are double as large. Has proved healthy and productive, and will be very valuable for those who desire a first class table as well as wine grape.

No. 4. Nearly as large and as good as Black Hamburg, very productive, and is, we think, the most desirable table and market grape of all we know.

No. 8.—Late, red, very productive and good, similar to No. 1, except in shape, as the berry is round. Has the same Muscat flavor, would be valuable for late keeping, and will, we think, also make a good white wine.

No. 9.—To those desiring a substitute for the Catawba, this will be an acquisition. It is of about the same size and color, better in quality, productive, healthy and hardy, in short, an improved Catawba, without the faults of that old standard variety, and makes an excellent white wine.

No. 12.—Similar to No. 9 in flavor and color, but larger and later.

No. 15.—Handsome, but proved again subject to mildew and rot, and with a peculiar scratch in the throat, which we do not fancy.

No. 19.—Similar to No. 4, but not quite so good, nor does it seem to set fruit as regular as it.

No. 22, *or Salem.*—This, Mr. Rogers calls his best variety. It fruited for the second time with us, and the bunches were much larger and finer than the first season. In quality it is even better than No. 4, and should it prove as productive and healthy, will certainly be one of the most most desirable of all our grapes.

These are all of the Rogers we have fruited, although we have nearly all of the numbers growing.

Rulander or St. Genevieve.—This has again produced a medium crop of most excellent fruit, and although it will not bear *big* crops, it makes up in quality as a wine grape, what it may lack in quantity. It makes an excellent wine, closely resembling Sherry, to which the committee at Cincinnati unanimously awarded the first premium as best light colored wine, and numbered it 100 on their scale, being their ideal standard of perfection.

Taylor.—This little grape has gained many friends this season, as the crop was satisfactory both in quantity and quality. It seems that the vines require age, and spur pruning on old wood, to make it produce well. Give the vine plenty of room, and plenty to do, i. e. prune it long, and we think it will bear satisfactory crops when it is three or four years old. The vine made of it more closely resembles the celebrated Riessling of Germany and the Rhine, than perhaps any other of our American varieties, and will always command a high price with wine connoisseurs.

To Kalon.—Suffered again from mildew and leaf blight, and although good in quality, is not worthy of cultivation here.

Telegraph.—Many writers contend that this is identical with the Christine. We are unable to say whether they are right or wrong; but the *true* Telegraph, as we have it, is certainly one of the most promising early grapes we cultivate. It is as early as the Hartford, but much superior in quality, and promises to become not alone a good table fruit, but also an excellent wine grape. The writer in *Colman's Rural World*, who has found it so "abominable foxy" and a "most unmitigated humbug" certainly had not the *true* Telegraph. This, although evidently a Labrusca, has very little, if any, foxiness, is a medium sized, compact bunch, berry round, black, juicy and sweet, but very sprightly, and so far has proved healthy, productive and hardy. Should be tried by every one.

Thompson's Red Seedling.—I received scions of this from Mr. Thompson, originator of the Mo. Mammoth Blackberry. He claims it to be a seedling of the Concord; but this bears such a striking resemblance to some of Roger's Hybrids that we can hardly think it a true Labrusca. Had but a few scattering bunches this season, and we wait for next season before we can give a decided opinion about it.

Union Village.—See *Ontario.*

Venango or Minor's Seedling.—Always healthy and productive, but too pulpy and foxy to be of much value.

MAPLE SUGAR.

BY G. C. BROADHEAD.

The sugar tree, *acer nigrum*, is abundant in portions of Missouri, but in some districts is rare, and in some counties I have not seen it at all. Where one tree is found there is generally a grove of them, for it seems not to like being alone. It is never found growing on flat ridges, nor on very poor land, and seldom on flat bottom lands; seems to prefer sloping hillsides, especially if they are rocky. Groves of large trees are often found growing on the bluff soil of the hills, extending one or two miles from the Missouri river bottoms, also along the valleys of the smaller creeks flowing to the Missouri, in every county, from St. Charles to Chariton, and in some of the western counties, as Clay, Platte, Buchanan and Andrew; west of mouth of Nodaway river I have not seen it.

In Lincoln county, near Auburn, are extensive and very beautiful sugar groves; here they spring from a rich magnesian limestone soil, reposing on the Upper Trenton limestone beds.

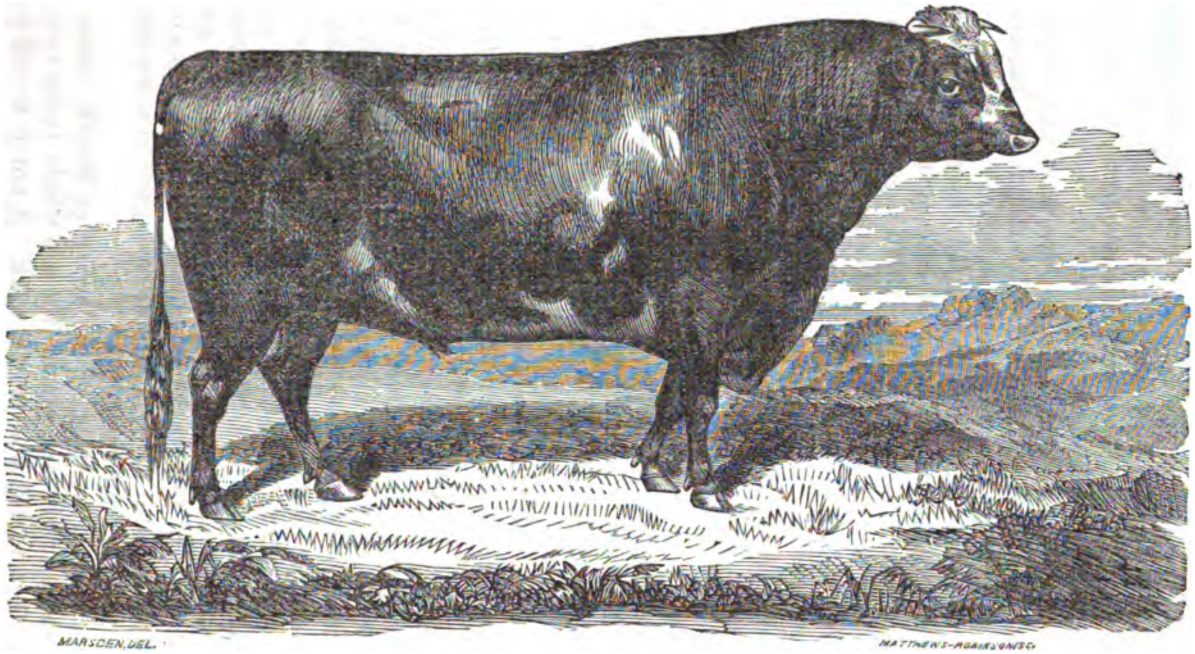
In Pike and Ralls are extensive sugar groves, mostly along the smaller streams making towards the Mississippi and Salt river. After leaving the adjacent Mississippi water shed, in going westward, north of the Hannibal and St. Joseph railroad, sugar groves are not abundant. In the northeast part of Knox county are some small groves, also on Sugar creek, in Adair county, along which last-named creek are many sugar trees, which disappear as soon as the creek reaches Chariton bottom. In Sullivan and Daviess are also some small groves, but westward I have not seen any, until we reach the Missouri river hills in Andrew county, where they abound, growing on hillsides and valleys of small streams, on soil formed from the limestones and shales of upper coal measures, mixed with bluff clays.

In southeast Missouri and southwest Missouri we find beautiful groves of it on the bottoms of the smaller clear streams, growing on cherty and magnesian limestone soil.

At present there is not much sugar made from the tree in this State, and I have only a few statistics of its former yield.

About the years 1840 and 1845 there was a good deal of sugar made in Montgomery and Warren counties. On Massey's, Bear and Loutre creeks there was annually made, in one township from 10,000 to 12,000 pounds of sugar, every family making the sugar for its own home consumption, and some making it for sale, selling it to the merchants at ten cents per pound, and receiving payment in goods. A family would generally make from 400 to 500 pounds per year. Two persons would sometimes make as much as 1,000 pounds in a year. In the same district, in 1859, there was not over 500 pounds altogether made. People found it more profitable to engage in some other business, and buy sugar from the stores.

After very cold weather in February or March, when the sun would first shine bright and warm, the sap would begin to rise, then the sugar maker would prepare to work. A notch would be cut on the side of the tree, and just beneath a hole be bored into which would be inserted a spout made of elder, from which the water would flow into a common trough of about two feet in length, made of soft wood, roughly made with an axe. A boy with a horse and sled would drive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AYRSHIRE BULL, "HONEST JOHN."—OWNED BY WILLIAM BIRNIE, SPRINGFIELD, MASS.

around to the trees and collect the water and haul it to a common place, where it would be boiled down to syrup or into sugar.

As an article of syrup the maple molasses can not be surpassed in excellence. I consider it superior to the best Belcher's syrup, and as beautiful in appearance. It is to be regretted that so little is at present made. We believe that, with proper management, it could be made a profitable business.

As a shade tree none can surpass the sugar tree in beauty; erect, clothed with thick dark green foliage, it affords a grateful shade, and in autumn its leaves, before falling, become of a rich deep crimson. Its growth is slow, and much care should be taken in transplanting it, for it is unlike its congener, the white maple, which is easy to make live and of rapid growth.

The wood of the sugar maple is hard and firm, and makes good fuel. It is also valuable for making strong frames, and is often used in making boxes and moulds to press tobacco in.

AYRSHIRE CATTLE.

BY H. C. MERRIAM, LOWELL, MASS.

There has been, throughout the New England, the Middle and Western States, a wider distribution of blooded cattle for the purposes of breeding, within the last three or four years than in any previous ten years. Farmers are, generally, beginning to inquire after blood. The fact, that in the great cattle markets of the East, blood cattle, (grades) whether for stores or the shambles, sell commonly, 25 or 30 per cent. higher than scrub cattle, (age and cost of production considered) *has disarmed* prejudice and conservatism and opened the minds of agriculturists to conviction, and led to the general inquiry, which is the *best* of the improved breeds?

This depends upon the circumstances and the purposes of individual farmers—the character of the farms, location, climate, purposes, &c.—we shall confine ourself, for the present to the consideration of the Ayrshires, their origin, qualities and adaptations.

The county of Ayr, Scotland, is situated on the eastern coast of the Firth of Clyde, and was divided into several districts; that lying on the north of Irvine is *Cunningham*—that between the Irvine and the Doon is the Bailiary of *Kyle*—that on the south side of the river Doon, is called the Bailiary *Carrick*, now united in the county called Ayr. The land is rough and difficult to till, but well adapted to pasturage for light cattle—the soil is clayey and rich—the native cattle were small, tough, hardy race, and would be of little value to the farmer of the present day. Cunningham and Kyle are the districts which have the honor of being the birth places of the modern improved breed of Ayrshires. They were, at first, called Cunninhan

Dunlops, Dutch, &c., after the names of their particular breeders, locality, or after the blood with which the natives were crossed. It is doubtful whether any pure Dutch cattle were ever imported into Ayrshire, to cross with and improve the hardy, native cattle, for previous to any improvement, the old Durham, of England, in the districts of the Tees, Holderness, Durham and Yorkshire, were called *Dutch Cattle*, because their progenitors, on the one side, were imported from Holland, already distinguished throughout Europe for its large and pre-eminent breed of dairy cattle. The name of Dutch, although yielded to that of the district where each was bred—so with the Ayrshires, at length, having become a definite breed, with special adaptations to the purposes of the dairy, on the soil and in the climate of Scotland.

THE DATE AND MANNER OF THEIR ORIGIN.

Col. Fullerton, in his "Husbandry of Ayrshire," says, (in 1793), (whose authority Youatt says is entitled to weight as to everything relating to this subject) that the Earl of Marchmont, in producing this breed, bought of the Bishop of Durham several cows and a bull. The cattle were kept, for a time, at Lord Marchmont's seat in Berwickshire, and then taken to his Lordship's estate in Kyle, one of the above districts of Ayrshire. These cattle were of Teeswater breed (part Dutch). Their progeny, a cross of this breed with the native cattle, spread over various parts of Ayrshire. Mr. Youatt says, "that the Earl of Marchmont did not become *Earl* until 1724, and died in 1740." Therefore as the present improved breed originated from this and other importations, of similar cattle, their origin must date at about 1730. Let it not be forgotten, that at the time Mr. Robinson wrote, there were hundreds of men under seventy years of age, in Ayrshire, who had been eye witnesses of the whole progress of improving this breed down to 1793, when it had acquired a definite character as a distinct breed; since which time, it has been perfected and distributed throughout the civilized world, as a pre-eminent dairy stock, adapted to soil and climate.

Mr. Aiton says, "that he remembered well the time when Dutch cattle, or short horns were introduced into Cunningham, (famous as one of the districts where the Ayrshires originated) by Mr. Dunlop. These cattle, he says, excited much public attention; the small farmers began zealously to raise up crosses from them," (called Dunlops) "which were extensively spread throughout the county of Ayrshire." After a time, many noblemen imported similar cattle, called Dutch, but as they mostly came from England, it is more than probable, that none of them were pure Dutch, but rather of the Teeswater, or Holdeness breed, which for a long time, were called Dutch after their ancestors on the one side, and a cross with the native cattle of the above English districts, with the Dutch cattle. From crosses obtained from these foreign cattle, the whole county of Ayrshire, at length became stocked, and to-day, the descendants of the Cunninghams and Dunlops, by the name of Ayrshire, constitute emphatically, the diary stock of Scotland, and are appreciated in every improved dairy region on the globe. As early as 1800, they had become a definite and well defined breed, which has since been much improved, and is now preeminent as a distinct dairy breed wherever an improved agriculture exists. It is a remarkable and interesting fact in agricultural history, that the Dutch cattle, distinguished as dairy stock, long before the Durhams or Ayrshires existed, were the foundation of the most famous breeds of cattle in the civilized world.

Let it not be forgotten that Mr. Aiton's memory and observation extended back to 1760, therefore, his means of knowledge were ample from observation and living witnesses, and what he says, in his survey and treatise " On the Dairy Breed Cows," in relation to Ayrshires, is reliable, for he was a fair minded man and a dilligent investigator of facts.

Mr. Flint in his valuable work on " Milch Cows and Dairy Farming," says that the above cattle were imported into Ayr by the Earl of Marchmont, about 1750. This must be a misprint, for the Earl of Marchmont died in 1740, before which time the improvement must have been commenced, and Mr. Aiton's recollection extended back to the origin of the Ayrshires in Kyle, as Dunlop cattle, about 1760, therefore, the manner and time of their introduction is quite definite.

WHAT THE AYRSHIRES WERE AND WHAT THEY ARE.

At the time of the origin of this herd, the condition of the agriculture of Ayr, was rude and primitive. There were scarcely any practical roads in the country—the farm-houses were mere hovels, having the fire-place in the middle of the room, the dung hill at the door—no fallows, no green or soiling crops, no sown grasses, no esculent roots, no vegetable garden, unless a few scotch kail, little straw, no hay except of the coarsest quality collected from the bogs, no available manure, no carts or wagons to carry it to the fields, already scourged by the exhaustive system of husbandry till it would hardly pay for seed and labor, the cattle, starving, were suffered to poach the cultivated lands from the end of harvest until seed time. Their dressed weight less than 300 lbs. and their product of milk, in the height of the season, did not exceed 6 or 8 quarts per day. To-day, Scotland may be regarded as the model farm of Europe.

Under these adverse circumstances, the native cattle of Ayrshire corresponded with the condition of its agriculture (as cattle generally do, of whatever breed). Of these native cattle, Aiton (whose recollections extend back to the introduction of the new breed into Cunningham) says: "The native cows kept then in the districts of Kyle and Cunningham (parts of Ayrshire), were of a diminutive size, ill fed, ill-shaped, yielded but a scanty return of milk, were mostly of a black color, with large stripes of white along their backs, about their flanks and on their faces; their horns, high and crooked, having deep rings about their roots, proof of poor keeping; the chines of their backs stood up high and narrow, their sides were lank, short and thin, their hides thick, adhering to the bones, their hair coarse and open, and few of them yield more than three or four Scotch pints (6 or 8 quarts) of milk, per day, when in their best plight; or weighed, when slaughtered, more than from 12 or 16 to 20 stone, avoirdupois, sinking offal." Such was the parent stock, on the one side, of the modern Ayrshire —which improved breed, Mr. Aiton, in his "Treatise on Dairy Breed of Cows," describes thus: "Head, small, but rather long and narrow at the muzzle; the eye small, but smart and lively; the horns small, clear, crooked, and their roots wide apart; neck, long and slender, tapering toward the head, with no loose skin below; shoulders, thin; forequarters, light; hindquarters, large; back, straight, broad behind, the joints rather loose and open; carcass, deep, and pelvis capacious and wide over the hips, with round fleshy buttocks; tail long and slender; legs small and short, with firm joints; udder capacious, broad and square, stretching forward, and neither fleshy, low hung, nor loose; the milk-veins large and prominent; teats short, all pointing outwards, and wide apart; skin, thin and loose; hair soft and wooly; the head, bones, horns, and all parts of the least value, small, and the general figure compact and well proportioned."

Thus the reader has the beginning and end of this improvement, and cannot fail to see that a homely and almost worthless animal, which, in 1743, yielded, at best, but 6 or 8 quarts of milk per day, (Mr. Youatt says it is a bad Ayrshire that does not yield treble this quantity) has, by care and skillful breeding, been made to produce from 18 to 30 quarts of milk per day, and more than double the amount of beef. A cow of this breed, imported into Massachusetts, averaged 10½ quarts per day for the whole year, and another, imported by the State Society, yielded 16 pounds of butter per week, for several consecutive weeks, on grass alone. Cows, well reared, make from 500 to 700 lbs of beef, and three year old steers from 800 to 900 lbs.

If we compare the improved breed with the native cattle, from which they originated in part, the contrast is as great as possible, and equally favorable to the moderns, so much so that the supposition that the present Ayrshires are the result of careful breeding, by selecting the best native animals for the purpose, is preposterous. The Ayrshire breed possesses definite, hereditary qualities, which indicate to them what foreign blood was resorted to, and what qualities of the natives remain in the improved breed. The qualities which it would seem impossible could be realized by this course of breeding, while expert breeders and good judges of cattle detect, at once, features and qualities, which indicate the old Durhams, or Dutch, as they were for a time called. This was Mr. Youatt's opinion, and we came to the same conclusion, after examining the early importations, before we had studied their history.

THEIR DAIRY CHARACTER.

Mr. Youatt (high European authority) says "that the daily yield of an Ayrshire cow, for the first three or four months after calving, is 20 quarts per day; next three months, 13 quarts; next four months, 6 quarts—or 850 gallons per annum. He estimates the average of a large dairy at 600 gallons, from each cow, per annum, or 257 lbs. of butter, or 511 lbs. of cheese, per annum from each cow. This appears to be a fair estimate, though Mr. Aiton sets it much higher, and Mr. Rankin lower. A cow imported into Massachusetts, by John P. Cushing, Esq., gave, in one year, 3,864 beer quarts, or 966 gallons, at 10½ lbs. to the gallon, being an average of over 10½ quarts per day for the whole year; and Mr. Flint says, in his work on "Dairy Farming," that the first Ayrshire cow imported by the Massachusetts State Society, for the promotion of Agriculture, in 1837, yielded 16 lbs. of butter for several weeks in succession, *on grass feed only*—and that there is good authority for this statement. Mr. Geekee, factor to the Duke of Montrose, says, "that a good Ayrshire cow, bred in Dunbartonshire, averaged 5½ Scotch pints (11 quarts) per day for the whole year," therefore, the yield of Mr. Cushing's cow was not extraordinary for this breed, she being surpassed by many of this breed in their native land, where all cows do best, being acclimated, and fed with feed to which they have always been accustomed.

OF THEIR BEEF QUALITIES.

Mr. Youatt, and other authorities, declare that they will feed kindly and profitably, and that their meat is good, marbled with less pure tallow than other breeds; that they will fatten on farms where other breeds could not be made to thrive at all; that they unite, perhaps, to a greater degree than any other breed, the supposed incompatible properties of yielding a great deal of milk and beef. It is on inferior soil, and the moist climate of Ayrshire and the west of Scotland, that their superiority is most remarkable.

On their natural food, of poor quality, they give milk abundantly and long, but when they are moved to richer pastures, they convert their food more into beef. There is a lurking tendency to fatten, about them, which a good pasture will bring to light. The cows will make from 560 to 700 lbs., and good three year old steers, from 800 to 900 lbs. of beef. They show their beef qualities when transported to the rich pastures of England.

Their general character, according to Mr. Flint (who is high authority, being well posted by observation, travel and study, and very candid and careful in his statements), says, "for pure dairy purposes, the Ayrshire cow deserves the first place, having been bred

AYRSHIRE COW "FLORA."—OWNED BY WILLIAM BIRNIE, SPRINGFIELD, MASS.

almost exclusively with reference to their milking properties—a race surpassing all other pure breeds for rich milk, on soils of medium fertility. The best milkers I have ever known were grade Ayrshires, larger than the pure bloods, but still sufficiently high grades to give certain signs of their origin, while the breed, to *some* extent, *seem* to combine the two qualities of giving much milk, and adaptation for beef."

They are generally red and white, some mottled. They are a gentle, orderly and quiet breed, but it must not be supposed by the reader, that they are equal to their short horn sires, when transplanted to luxuriant pastures, or to the Dutch or Holstein cattle, when high fed for the dairy, *particularly* for cheese making, or for beef and working oxen.

AN ERROR AS TO THEIR ORIGIN.

Some have maintained that the Ayrshires are indebted to the Alderney blood. This, we are satisfied is a mistake. Youatt says "that it requires but a moment's inspection of the animals to convince us that this supposition is *altogether erroneous*." Such a cross with the native cattle could never have produced the size and properties of the modern Ayrshires. The earliest authentic writers, who had ample means of knowledge of the process by which these cattle had been bred, up to the time of their published accounts, either from personal observation or eye witnesses, make no mention of Alderney blood being introduced; or they repudiate the idea in their detailed history of the origin of the Ayrshires. Mr. Youatt also says, that in Renfrewshire, the Highland cow has been properly superceded by the dairy cow of Scotland, the Ayrshire. The Alderney was tried but she would not answer—she was crossed, with little success, by the native bull—the Durham was afterwards attempted and the Alderney crossed with it; all has given way to the Ayrshire." This impliedly repudiates the idea that the Ayrshires are indebted to the Alderney blood, for, having bred the Alderney blood in several ways and failed, they would not have been likely to have sought it in the Aryshires, and if it had existed in the Ayrshires, they would have known, mentioned and appreciated it, for their hobby of making an improved cow, by Alderney blood having failed, they would have justified their theory and efforts by pointing out the success in Aryshire. As they did not do this, he concluded that they could not, because there was no Alderney blood in the Ayrshires.

We have always kept Durhams and never owned an Ayrshire cow, but have known well the Ayrshires since their earliest importation into this State, (Massachusetts). We believe the authorities and opinions above quoted, are substantially correct and preferable, being made at very distant times and countries, to any man's individual opinion, for no man can be, in his opinions, independent of his biases and prejudices, any more than he can be independent himself.

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In conclusion, we would recommend the Ayrshires to the particular attention of all farmers whose circumstances and purposes require a breed of cattle of their peculiar and special adaptations.—*Western Farmer.*

BEES AND BEE CULTURE.

As the subject of bee culture has received no attention in previous reports, it is thought best to put together a few interesting communications on the subject received during the year, and published in the *Journal of Agriculture.* They are well worth preserving and may be read and referred to with profit by those interested. Mr. A. E. Trabue, of Hannibal, has devoted a good deal of attention to bees and their management, and the results of his observations and experiments in regard to the Italian bee are quite interesting and instructive.

BEE PASTURAGE IN THE WEST.

Having had some experience in the care and management of bees, I would offer a few hints on this subject for the general good. I notice that there are a great many bees kept in this country, and, with the pasturage we have for them, the keeping of bees could be made much more profitable than it now is.

In the halcyon days of early spring, that betoken the resurrection of sleeping nature, how delightful to the ear of the lover of nature is the hum of this industrious insect. Bryant, when speaking of—

"—— the calm, mild day,
As still such days will come,
To call the squirrel and the *bee,*
From out their wintry home,"

understood and appreciated this charm of rural life that you in the metropolis know nothing about. So perfectly are the habits of the floral, and indeed the whole vegetable kingdom, adapted to the especial benefit of the honey bee, that it almost seems as though the designer and Creator had created these flowers for the sole purpose of furnishing the bee with honey. Instead of their bursting into life and beauty at once, under the influence of a warm sun and the genial atmosphere of spring, they come one by one and yield their sweets, then, dropping their petals, go on to mature their seed and furnish food for other races of beings.

The first of March brings the blossoms of the white and sugar maple, quaking asp, elm, and some varieties of the willow. April brings with it the perfumed blossoms of the wild plum, cherry and peach, followed by the rose-scented apple blossoms of our tame orchards, and the no less perfumed and honey-yielding crab apple blossoms of our groves and forests. With the floral month of May come flowers innumerable, that yield an enormous quantity of finely flavored honey. Besides the flowers, there is the honey-yielding blossoms of the black and honey locusts, white haw, wild black cherry, raspberry, blackberry and box elder. In June we have, added to the large number of wild flowers, the honey-laden blossoms of our meadows and pastures. The white and red clover blossoms that grow not only in our meadows and pastures, but which are found covering all waysides and outlands, yield an abundant harvest. During the latter part of the month of July, all sources of honey measurably fail, until the fore part of August, which brings, among other sources, the snow-white blossoms of buckwheat. This is raised to a considerable extent here, and is the richest harvest of the year. It usually lasts till frost.

The meager supply of honey from flowers and blossoms during the latter part of July, might, to the casual observer, be considered an injury to the honey bee and its business of making honey; but a little further observation shows that it is not the case. About this time the comb is filled, and the honey that has already been gathered is to be sealed over and secured; the brood of young ones is to be nurtured and matured to supply the place of those which have gone forth in swarms; pollen, or bee bread—that is furnished principally, at this time, by corn tassels—is to be laid up for the next spring's brood, then to be reared, and the industrious bee takes this opportunity to gather and store it up. After the early frosts there is not much honey to be collected, except from the yellow fall blossoms which now appear amid the faded verdure of decaying nature. But now the weather is too cold for gathering honey, and the bee only struggles for a time with the chilling winds of autumn, then ends the campaign and returns to winter quarters.

The richness of the bee pasturage of the West is indeed great, and, with an average crop of buckwheat, each square mile would afford an abundant supply for hundreds of stocks. Buckwheat is of itself the most sure and profitable crop that can be raised, and when sown near the bees it will give them from ten to thirty pounds of extra honey per stock. B.

THE HOME OF THE HONEY BEE.

HANNIBAL, MO., 1868.

The impression seems to be general that native bees do not voluntarily inhabit near the ground, and are never found wild, except in high situations. A writer in the *Country Gentleman* in effect asserts this to be true, and calls on any one with a contrary experience to speak out through the press. I for one have to say that I have often found them near the ground, and in two instances I have reason to believe they were so by choice.

Year before last one of my hands discovered a strong colony of bees in the hollow of a tree that was lying on the ground. This tree had been cut in the night, three years before, to capture a racoon. We argued the bees must have been in the tree at that time, and were not discovered because of the darkness—indeed we concluded the coon had found the bee tree before we did, and was after honey when we caught him. (The coon will insert his fore paws in the hollow, and stirring it round and round, will then withdraw it and lick the honey clean. If his fore paw will not reach it he will stick in his hind leg.) It seeming to be pretty clear the colony was three years old, I gave the finder five dollars for the chance. We split the tree open, and made a regular water haul. There was hardly a tea cup full of honey, and no comb more than a year old. It was certain then that this colony had taken possession after the tree was cut, and it was lying on the ground.

Again, last year I was passing through the apiary and discovered some native bees busily perambulating in and out of an old box hive, out of which I had transferred a colony of bees that spring. Supposing they were searching for honey I paid no attention to the circumstance at the time, but in passing the same point a few days afterwards I noticed a much larger number there, and, besides, a number of black drones who were not able to get in because of the narrow entrance. I turned the hive up and discovered a large colony had taken possession, probably the same day. This box hive was setting flat on the ground in its natural position. Here are two cases where they appear to have colonized pretty close to the ground.

I will state another instance: Some years ago I was exploring the grounds of Thomas Moorman, Esq., of Marion county, Alabama, and discovered an excavation in the middle of an old field. I inquired the cause, and he readily gave me a detailed history of the case. It appears he had bated and lined a swarm of bees from all directions, and they had inevitably pointed every time to this identical field. He had explored every nook and corner of it, repeatedly, until he was positive there was no bee tree in it. He was about to give it up for a bad job, when he accidentally looked *down*, and saw them going in and out of the *ground*. He declared that in all his experience he had *never found a bee tree in the ground before*. Mr. Moorman was then eighty years of age—a Virginian of the good old school, and his word is good anywhere.

If it were true, however, that bees invariably locate in high positions, that would be no reason why we should elevate them. By nature we are naked, and locate in dens and caves; it is natural for the fruit tree to multiply by seed after its kind—must we therefore have no budded fruit, no clothes, no houses?

So far as my experience goes it is better that the hive should be near the ground. All of my hives are on the ground, or separated from it only by a board. The comb does not mould. The weary and heavy laden bee returning late at evening not seldom misses the entrance, and falls to the ground. Though chilled, they can still crawl into the hive, whereas, if it were high they would never reach it. Weeds must not be allowed in front, nor high grass. Neither is it very important in what direction the hive faces. If it fronts the south in the summer the heat of the entrance is too great, and in winter the bees are invited forth by the sun in unsuitable times. If the west, the high winds of summer and winter dash them to the ground, and the setting sun invites them forth when they should remain at home. If the north, they get to work too late of a morning, and quit too soon at night, besides other objections. If the east, some think they get to work too soon, and many are lost, chilled by the morning dews. I think the east or southeast less objectionable than any other. It is the early bird that catches the worm. Many plants, such as buckwheat, and our yellow prairie flowers, are rich in honey in the morning only; whereas after ten o'clock, unless the day is cloudy or moist, the fount of honey is dry. Neither would this aspect tempt them forth too late in the evening. Many bees foraging after sundown are lost and never return. My Italians have been found watering three miles from home as a regular thing. A neighbor found them at that distance, and lined them home, supposing he had found a wild Italian hive; and yet there was plenty of water at all times within a stone's throw of their home.

A. E. TRABUE.

THE ITALIAN HONEY BEE.

A correspondent, in a recent communication, doubts whether his Italians gathered any red clover honey last fall. If he had noticed the color of the honey his Italians brought in when the second crop of clover was in bloom, he would not have doubted long. Red clover honey differs in color from any I know of; it is a beautiful bright, light pink; honey dew is dark, brownish red. The two, though something alike, can not be confounded. The first has the true clover taste and perfume; there is nothing to excel it. It at once gratifies the eye, the taste, and the smell; whereas honey dew is scarcely better than so much golden syrup.

There is a great deal of honey dew this year; the leaves of the hickory, the post or burr oak, the black oak, and walnut are loaded with it. It accumulates on the hickory so as almost to run from the leaf; the upper surface of the black oak is varnished with it; the weeds and grass beneath these trees are bespattered with this excretion, while the same plants at a distance from these trees have none at all—thus at once betraying its origin and nature. The aphides are to be found on many of them—some translucent, others a steel gray color. All kinds of bees are busy gathering this honey until nine o'clock A. M., when the sun has gained power to dry it up for the day; the night dews again dissolve it, making it available to the bee until dry again.

Last year I bought a platform scale, and selecting a medium hive of Italian bees, placed them on the platform, so that whenever I might pass, by observing the beam, I might know whether they were gaining or losing. I recorded their weight morning, noon, and night, from the 8th of June until the 17th of September. It might be interesting to some of your readers to give this record in full, but not being of general interest, I will give the result in weeks. A native hive of black bees, weighed occasionally, will also be given, as many people wish to learn the difference in the working capacity of the two races.

WEIGHT OF BEES AND HONEY, EXCLUDING WEIGHT OF HIVE.

Date.	Native Black Bees.	Italians.	Remarks.
June 8	4¼ pounds	4¼ pounds	
15	16 pounds	17 pounds	Took two swarms from Italians.
22	17⅛ pounds	4¼ pounds	
29	18 pounds	12 pounds	Linn in bloom.
July 6		19 pounds	Rain fall of three inches.
13		25¾ pounds	Weather clear.
20		28¼ pounds	Buckwheat in bloom.
27		29 pounds	Weather clear.
Aug. 3	20 pounds	28 pounds	Weather clear.
10		28½ pounds	Honey dew.
17		28¼ pounds	
24	19 pounds	26¼ pounds	
Sept. 1	18 pounds	27¼ pounds	
8		31½ pounds	
15	17¼ pounds	32 pounds	

On the 15th, two swarms were taken from the Italians by placing the queen with one brood comb and half the young bees on the old stand, and removing the balance of bees and brood three feet to one side. These two colonies made 25 pounds of honey each. Thus the Italians stored 87 pounds of honey to 17¼ pounds of the blacks. The latter did not swarm.

Our rain-fall from the 5th of July till frost did not exceed five inches; vegetation dried up—no blossoms to be had. I planted and replanted buckwheat broadcast, but none sprouted. Finally, taking a large wheat drill, putting a fence rail across the hoes, and a big nigger on top of that, the shoes of the drill were sunk about six inches into the dusty soil, and a dampness was reached that sprouted the grain. But there seemed to be but little honey in the blossom, and I hardly got my seed back.

Determined, however, to increase my colonies, I concluded to try feeding. I took a tin pan three feet square, and filling it with white sugar syrup, set it out convenient to the bees, first strewing timothy hay over the compound. There was at once one of the biggest fights over the mess ever known. They attacked each other and everybody. A colored servant was run off a quarter of a mile into the brush, and declared she never would come back any more. Between ten and fifteen thousand bees were slain. Appalled by this disaster, but not whipped, I concluded to feed each individual weak swarm in its own hive. Procuring a number of half gallon tin cups, and filling them with loose timothy hay, I then poured in a syrup of white sugar of about the consistency of unsealed honey. One of these I set in the upper chamber of the hive, and secured it so that only the bees requiring aid could reach it. When they had consumed the supply, I poured in additional syrup without driving out the bees therein, because, the syrup being thin, they could climb to the top by the timothy hay, where the other bees could clean them off. In this way, by the consumption of two barrels of granulated white sugar, in the month of September, I built up twenty-five or thirty weak colonies to be strong enough to winter.

I tried a variety of experiments in wintering bees: burying them like potatoes in pyramids in the ground; in long ditches; in the frost-proof root house; in the cellar; in a rock house adjoining the ice house; under a large pile of sugar cane begasse; in large clusters, side by side and on top of each other (without other protection than the warmth that each colony would impart to the other). Without detailing these experiments, suffice it to say, I find storing them in a quiet, dry, dark cellar, where the thermometer will stand at about 40°, produces the best result with me, with the least trouble. Without any protection whatever, I have known a medium colony in an old square gum consume only one pound of honey per month through the winter, but this is very rare. It is common for them to consume four or five pounds a month. Over two-thirds of all those exposed to the inclemency of the weather without protection perished.

Not desiring this year a further increase of colonies, I commenced the year with the intention to secure the largest yield of surplus honey possible. In order to do this it was necessary to have them very strong early in the spring, so that at any time if a flow of honey occurred, there might be laborers in plenty to gather it. Accordingly, getting all my colonies out of their winter quarters early in March, I set out a box four feet square, open on the southern side only. On the bottom of this was strewn a quantity of rye flour. In a few moments the bees discovered it, and commenced packing it in their baskets. I repeatedly opened the hives to see whether they were not filling too many of their cells with it; but it must have been fed directly to their young, for I never could find any of account in their cells. Thus they carried off two bushels and a half of flour the two last weeks of March. The elms and other trees then bloomed, and they refused the flour. When the apple and other fruit trees had shed their bloom, I knew from experience in this section that there would be nothing more for them to get until white clover came into full bloom—a period of three weeks.

When bees have a scarcity of honey stored in their hives, it is sometimes the case that (when no honey is coming in from abroad) the queen ceases almost entirely to lay, and even the brood already under way is mercilessly torn from their cells and destroyed.

I had one hundred swarms with plenty, but there were some twenty-five or thirty more with scarcely any. It was evidently too much trouble to stimulate all these with food separately, and to feed them all in common too hazardous. How to bridge over this chasm of scarcity troubled me much. Finally, it occurred to me that I had seen the bees feeding very peaceably every spring, when the weather permitted, on the sap of the sugar maple. Why did they not slaughter each other over this, as they had over my pan of syrup, the year previous? Obviously because the maple sap was so weak in saccharine they did not care enough about it to fight over it. Acting on this idea, I prepared a trough twenty feet long, one foot wide, and one foot deep, then a float of pine lath, shaped like a gridiron, to float loosely in the trough. Into this was poured a quantity of water, with enough syrup in it to be decidedly sensible to the taste, but nothing more. They fed on this eagerly and quietly; on fair, warm days they would carry off twenty-five gallons a day. And yet so rapidly did they breed that I could never find more than a tablespoonful of the water in their hive at a time. I think that a good deal of it was regurgitated between the trough and hive. A fine mist of limpid water was plainly discharged from numbers of them as they took wing; not a particle of saccharine or any foreign substance could be found in this discharged fluid—it was simply water.

Now, how's this? Are not atoms of water grosser than those of sugar? Fill a tumbler brimming full with the former, it will still absorb a quantity of sugar without increasing its bulk. Plainly, the particles of the latter substance penetrate, or are packed in between those of the former, and are therefore smaller. What sort of a patent right sifter then has the honey bee, by which they can in a moment screen out through their lips large particles, and retain smaller. Let our inventors look to it and give us a fanning machine worth having. Another thing astonished me: Although carrying off as much as two hundred and fifty pounds of fluid in a day, yet the hives scarcely increase in weight at all. My own bees certainly got nearly all of it, for none have Italians in this neighborhood but myself, and ninty-nine one-hundredths of those feeding at the trough were Italians.

I thus fed nearly two barrels of white sugar, and when, on the last of May, white clover—that pale harbinger of civilization—peeped from its emerald screen, we were ready for the harvest.

It may be interesting to compare the following table with corresponding dates of last year. The difference is mainly to a difference of management, but in some degree to a greater flow of honey in vegetation this year than last:

Date.	Net weight honey.		
May 11th	15	lbs.	
18th	16	"	Stopped feeding.
25th	12	"	
June 1st	15	"	
8th	18⅛	"	
15th	53⅞	"	
22d	68¼	"	
29th	95¼	"	
July 6th	118¾	"	
13th	114¾	"	

The greatest run of honey this year was on the 12th of June, when the bees brought, in one hive, 10 lbs.; on the following day gained 9½ lbs.; on the next day 9 lbs.; the next 8⅝, etc. In one week this one Italian hive gained 59½ lbs., chiefly honey dew. On the 20th June came a severe check—very near a frost—thermometer at 40° at day-light. Bees remained at home evaporating the water from that already gained, and sealing it. They were 2 lbs. lighter at night. and the next lost ½ lb. more. The next day proved warm and genial They gained 1 lb.; the next 2½; then 3 lbs., and so on until the 28th of June, when they gained 6 lbs., the greatest gain in one day of the second run. Their gains then lessened, day by day, owing to the drouth, until the 2d of July, when clover, linn, etc., suddenly drying up, they lost weight in a clear sky; and they have declined daily until the present writing, when they have lost in all from the highest weight 7½ lbs. This loss, perhaps, is more apparent than real; being caused by the condensation of their previous gains, and in some degree from their amazing energy in exploring all nooks and corners of the vegetable world for honey, and finding none returned with sharpened appetite to the hive.

Mr. Quinby, of New York State, has written one of the most valuable works on the honey bee that we have, but in his last edition he strongly doubts whether bees ever brought in more than "three and a half pounds of honey in one day." This and other circumstances convince me that almost the whole of that work was written before he had much experience with the Italian bee. He, in common with almost every other writer on the bee, asserts that old mouldy comb is valueless, and should be cut out. I can assure him, and others, from my own experience, that if a piece of mouldy comb, even half filled with dead bees, is placed in the midst of a strong swarm of Italians, in the month of June, they will immediately turn out the dead, clean off the mould thoroughly and completely, and commence storing honey in that identical comb the same day.

In closing this article let us pause a moment and admire the almost divine energy of these little creatures. The sac of the honey bee will hold not more than a grain of nectar—indeed hardly so much. In one pound is 7.680 grains. The honey bees, then, in one hive of my apiary, on the 12th of June, made 76,800 successful trips for honey between sunrise and dark—equal to 5,120 trips each hour, or 85 each minute, or 1½ for each beat of the clock the weary day.

A. E. TRABUE.

HANNIBAL, Mo., July 20, 1868.

ITALIAN BEES.

Three years ago this spring the writer received his first Italian queens, and now has nearly one hundred hives of Italian bees. He is satisfied that they are superior to the common or black bees, first, in the prolificness of their queens; this is marked. Italian hives will be strong in spring, and throw off swarms from one to two weeks before the common bees. The great preventive of the ravages of the moth is to keep your hives strong; this very prolificness of the Italian queen keeps the hives strong. Seldom do we find moth worms in an Italian hive. Second, in vigor and energy. They commence work earlier in the morning; this is easily tested. Let a box with comb be exposed to the bees, the first bees that visit it in the morning, though there may not be more than one hive of Italians in twenty, will be the Italians, and they will be the last to leave it at night. This superior energy and vigor enables them to store more honey than the common bee. Third, in keenness of scent. This is also marked. Few who have kept the Italians have failed to notice this peculiarity. Let a dish of honey be exposed in a room with an open door or window, during the scarcity of honey, and the first bee that approaches it is sure to be an Italian. And fourth, in amiability of disposition. This has been questioned, and I will acknowledge that they are not always the quiet, gentle creatures that some have represented them to be. Excite their anger, and the same vigor and energy that leads them to work earlier and later than the common bee will make them more furious and less easily quieted, but my own experience is that they are rather more peaceable than the common bee. That they work on red clover any more readily than the common bee, I have not been able to see yet. But to conclude, the Italianizing of an apiary of common bees adds, in my humble opinion, fully one-third to its working powers.

L. C. F.

SWARMING OF BEES.

As this is the season of swarming, perhaps a few suggestions with regard to it may not be out of place in your paper. It is generally supposed that a hive will not swarm until most, if not all of the cells are so filled that the queen has no place to lay her eggs, and as this is not apt to happen unless bees are gathering honey freely, it is useless to look for swarms, particularly in the spring, until warm dry weather, as either cold or wet weather is unfavorable for the secretion of honey. Swarms seldom or never issue until at least one queen cell is capped over.

Those using the movable comb hive can by examining the frames every few days tell almost to a certainty when to expect a swarm, though occasionally bees will change their mind and permit the queen to destroy the royal cells.

No rattling of pans or any other noise is needed to make a swarm settle; in fact, I never was able to satisfy myself that throwing dirt or water among the bees ever had any tendency to make them settle, though others think it will.

The sooner bees are hived after clustering, the better the chances are of their remaining with you.

Hives need no rubbing with leaves or salt to induce bees to go into them; be sure they are clean, and free from cobwebs.

There is another thing very necessary, the lack of which has caused the loss of many a swarm of bees, and that is a cool hive.

After hiving a swarm, put the hive on a ventilating bottom board; it should not be raised, as bees are more inclined to remain in the hive if the ventilation is from below and the entrance, the only place they can get out. The hive should be well shaded, and in very warm weather sprinkling or syringing with water frequently will help keep the hive cool, and of course have a tendency to make the bees satisfied with their new home.

Occasionally a swarm will leave a hive when it seems as if all had been done that could be to keep them. If a swarm appears determined to "secede," put a box of honey on it, shut it up on its ventilating bottom board and take it into the cellar, keeping it there four or five days; it might be well to give water by putting a dish full under the bottom board and pressing it up to the wire screen, then the bees can help themselves.

I never knew a swarm desert a hive after remaining in it four days (unless an accident happened, such as melting down the comb), by that time there is brood which bees will seldom leave.

It may be necessary to explain what a bottom board is: it is simply a bottom board, with a six or eight inch square cut out of the center, and wire cloth tacked over it.

L. C. F

ARTIFICIAL vs. NATURAL SWARMING.

Which is the best? It is probably well known to all who have heard of the movable comb hive that one of the advantages claimed for it is that of being able with it to divide your bees, or in other words, to swarm them artificially. Those who are using the old box hives, nail kegs, hollow logs, etc., sometimes question whether an artificial swarm is good as a natural one. Actual trial of the two modes, under equal circumstances, will alone decide. Last year the writer tried both thoroughly, and could see no difference in results. There are several things in favor of artificial swarming. 1st. All swarms can be made early, and it is well known that an early swarm is worth far more than a late one. 2d. Swarms can be made at will —in other words, a person does not have to watch his bees all spring, and then have some of his best hives fail of swarming, or lose their swarms. This feature of the movable comb hive renders bee keeping more pleasant and safe to the business man who wishes to keep bee hives enough to supply his family with honey. How many have been deterred from keeping bees by the trouble of watching them during swarming time, and then of being taken from business to hive them after they had swarmed? 3d. Artificial swarms when made properly are more apt to remain than natural swarms. 4th. They are more easily made, as a general thing, than natural swarms are hived. How often has the bee-keeper, while getting ready to hive a swarm, been troubled with having swarm after swarm issues and persist in clustering together? I have had as many as four clusters together in one monstrous swarm. Then the question is what to do with them? To hunt up even *two* queens and put them in two hives is tedious business—to run them into three or four hives at a venture runs the risk of getting all the queens in one hive, when the other bees will either leave or join the hive with the queens. There is considerable loss in hiving two or three prime swarms together, unless the honey season is short or the swarms very small. Artificial swarming saves all of this, makes a certainty of increase of stocks, and of having few, if any late swarms. I say few, if any, because with a large number of hives, occasionally a hive that has been divided will throw off a swarm, but the cases are so few that they are hardly worth mentioning. Last season full two-thirds of the swarming in the writer's apiary was done artificially. He was pleased with it, and as stated before, could see no difference in prosperity. This season business called him away from home during the early part of the swarming season, so that when at home he had as much as he could do to hive natural swarms. The few that were made have done full as well as the natural ones.— In my next I will continue the subject of artificial swarming, detailing the different modes, their advantages and objections. L. C. F.

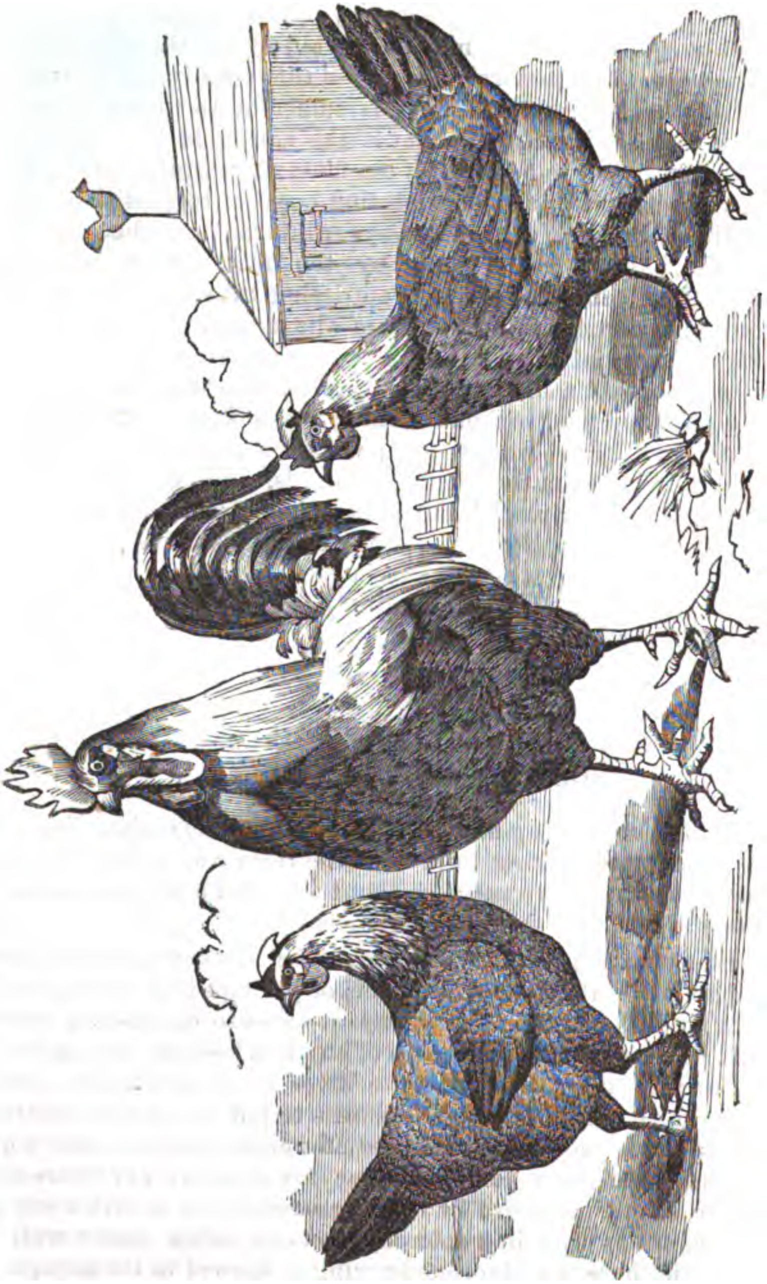
WINTERING BEES.

Bees require so little care and attention at the very time other stock require the most, that they are very apt to be entirely neglected; but I know of no stock so much benefited by a little labor rightly directed as bees. It is generally supposed that twenty-five pounds of honey, after the first of November, is sufficient to winter a hive of bees in this latitude in the open air; if the spring is late and wet, thirty pounds is barely enough. But our most successful apiarians find that it pays to build a house for wintering bees, or to partition off a room in the cellar. We have always wintered our bees in the cellar. We have a room eight by ten feet, ceiled perfectly tight, with floor cemented. Two ventilating tubes, one from the bottom at one corner, the other from the opposite corner at the top; both opening out doors with slides to regulate ventilation. A thermometer hung to a slide running through the door so as to be drawn out and examined without opening the door, gives us the temperature without disturbing the bees; we have four tiers of shelves. The hives are taken from their bottom boards, caps or boxes taken off, and placed upon strips of lath to raise them from the shelves so as to give ventilation; the holes in the top for honey boxes are left open. The shelves are movable so as to be taken down or put up to facilitate operations. We wintered ninety-two hives in this room last winter without the loss of one. L. C. F.

SUCCESS IN BEE KEEPING.

Success in bee keeping as well as success in everything else, depends so much upon taking hold of it the right way and sticking to it with a determination to succeed, that I will offer a few suggestions, which may be of use to the new beginner.

A person commencing bee keeping, as well as anything else, had better begin moderately. Two or three, or perhaps four hives, are as many as it would be safe in a majority of cases to commence operations with. These may be purchased of any bee keeper who has them to spare; or what may be better, have hives made such as you want, and engage some neighbor who keeps bees to put his earliest swarms in them. If the former plan is adopted, March or April is a good time to select and take them home. Choose hives under five years old, and that are strong in bees; by rapping smartly on a hive early in the morning, or any time in a cold day, you can judge pretty well of its strength; if there is a vigorous buzzing in answer to the raps, it is probably well supplied with bees; if the rap is but feebly responded to, better try another. They can be taken home any cool day by shutting them in the hive. If the most approved system is to be



Portraits from Life of Gray Dorkings, Imported from Europe, in the Spring of 1868, by D. W. Herstine, of Philadelphia.

adopted, the movable comb hive will have to be procured. After trying several kinds I am satisfied that Langstroth hive is the best. If common hives are to be used, twelve inches square by fourteen high, inside measurement, is a good size. No one should commence bee keeping without profiting as much as possible by the experience of others, as found in books and agricultural papers. Lanstroth's work on "The Hive and Honey Bee" should be owned and read by every bee keeper. Many are afraid to commence bee keeping on account of the moth. After learning its habits, any intelligent, industrious person can keep as free from it as he can keep his cornfield free from weeds. The careless, slovenly farmer will be troubled with weeds in his corn, with moths in his hive—and he ought to be; for my part, I am glad there *are* weeds to hoe and plow up, *moths* to kill and protect against; If it were not so, the farmer who 'has business" in town every day or two the year around, and transacts that "business" in whisky shops, lager beer saloons, and billiard rooms, would stand the same chance for success that I do who stay at home, sweltering in the cornfield or spending my leisure moments taking care of my bees. I rejoice that the Creator has ordained that "in the sweat of our face we shall eat bread." God offers no premium for laziness or carelessness; if he has given us weeds and moths to fight against, he has also given us the hands to fight the one, and brains to study and plan how to get rid of the other. L. C. F.

GRAY DORKINGS.

The cut of Gray Dorkings was first published, last fall, in the *Practical Farmer*, by Paschall Morris, Philadelphia, Pennsylvania, from which source it was obtained. It is one of the very best poultry engravings ever made in this country. The following description, which we also take from the same valuable paper, is copied from Tegetmeier's Poultry Book, and is given by a Mr. Douglass, a leading authority, in England, on this breed of poultry:

In selecting my brood stock I look for massiveness in all quarters rather than for a neat head or short beak, choosing birds with strong backs, and long straight deep breast bones; considering Dorkings entirely a table fowl, I think it is more important that they should have straight breasts than any other variety shown. Looking at Dorkings from this point, there ought to be as much difference in point of shape between them and game fowls as there is between a cart horse, with his large head, deep loins, and capacious chest, and a race horse, with fine, neat frame and slender limbs. The color in Dorkings, except in the silver-gray variety, is not material; but I have found the dark color the most hardy and heaviest fleshed, having once had a cock of that color weighing 14½ pounds, at two years, and several hens 11 pounds each. With regard to the general character of the brood stock I will describe those of the two sexes separately, beginning with the male. The cocks may be either single or rose combed. The single comb should be erect; but a slight lop at the upper part is not so great a drawback as in a Spanish; therefore, if all other points as well developed, I consider it but a slight defect. The rose combed cocks should have their combs well and firmly set on their heads, square in front, level in the spikes, and forming a peak or point at the back of the head.

The head in the Dorking, though not coarse, should be large, to correspond with the size of the body. The wattles should be broad and fine, and neatly rounded on the lower side. The neck should be long, stout, and profusely hackled with long feathers, but there should not be any thickness commencing a few inches from the head, and forming a sort of shoulder in about the middle of the hackle. The breast should be very broad and full, with a long bone, exceedingly deep in the keel, and extending well from the front towards the tail, so as to give space for development of flesh on the breast. The body cannot be too large and massive, with great length, depth and width. The back should be broad, and the wings largely developed. I much prefer the thighs to be well developed, so that they may carry plenty of meat. The legs must be straight, stout, and free from feathers. The feet should be five-toed, the extra toe distinctly separated from the others; the toes long, and well spread out; tail large, well expanded, and carried uprightly; the sickle feathers and tail coverts long, broad, well arched; carriage and appearance massive and grand.

In the hen, the beak should be stout; the comb, if single, well developed, and falling over on one side—if double, or rose, firmly set on the head, not too large, square in front, inclining to a peak at the back of the head. The wattles should be fine, and rounded neatly at at the lower edge; head long and deep; neck stout, and well set on the back; the chest broad, with great depth from the top of the shoulder down to the point of the keel of the breast bone, which should be straight and deep. The body ought to be large, almost forming a square when viewed from the side; back, broad and long. The wings should be large, but not so large, in comparison to the great weight of the body, as in many other breeds. The thighs may be long, and well laid along side of body—consequently the birds do not stand in a stilty manner. This is a point in which I conceive many breeders make a mistake. A Dorking, in my opinion, should have a well developed thigh, but from its being set nearly straight with the body, it is not evident. The legs should be short, and of a length in proportion to the size and weight of the bird. The feet must be five-toed, the extra toe well developed and distinctly separated from the others. The carriage and appearance of the Dorking hens should be matronly and dignified.

SHEEP AND WOOL MATTERS.

Death of S. P. Boardman.—Mr. Samuel P. Boardman, of Lincoln, Illinois, who was for many years intimately connected with the wool growing interest of the West, and who took an especial interest in the sheep husbandry of Missouri, died suddenly of apoplexy, at Lincoln, about the first of November.

He was 39 years old, a native of Granville, Ohio, and a graduate of Granville College. He settled in Illinois in 1851. His farm, called "The Sheepwalk," is located six miles east of Lincoln and is in an excellent state of improvement.

He became Secretary of the Illinois Wool Grower's Association at its organization, and held it until his death, to the entire satisfaction of the Society.

He contributed, for a number of years, to the *Prairie Farmer*, over the signature of "Wool Grower," and his articles attracted much attention. He was also a regular contributor to the *Journal of Agriculture*, St. Louis, almost from its commencement. As a writer, he was remarkably clear, concise, and practical. His writings showed him to be a master of his business, a man of superior ability, a great reader, and a careful business man. He was author of a monograph on sheep husbandry, which was published in the Missouri Agricultural Report for 1867, and also in pamphlet form.

Mr. Boardman was a man of remarkably good qualities of heart and head. He was frank, honest, genial, cordial and liberal. He labored for the good of his neighborhood, his country, and his fellow men, and his death is a public loss.

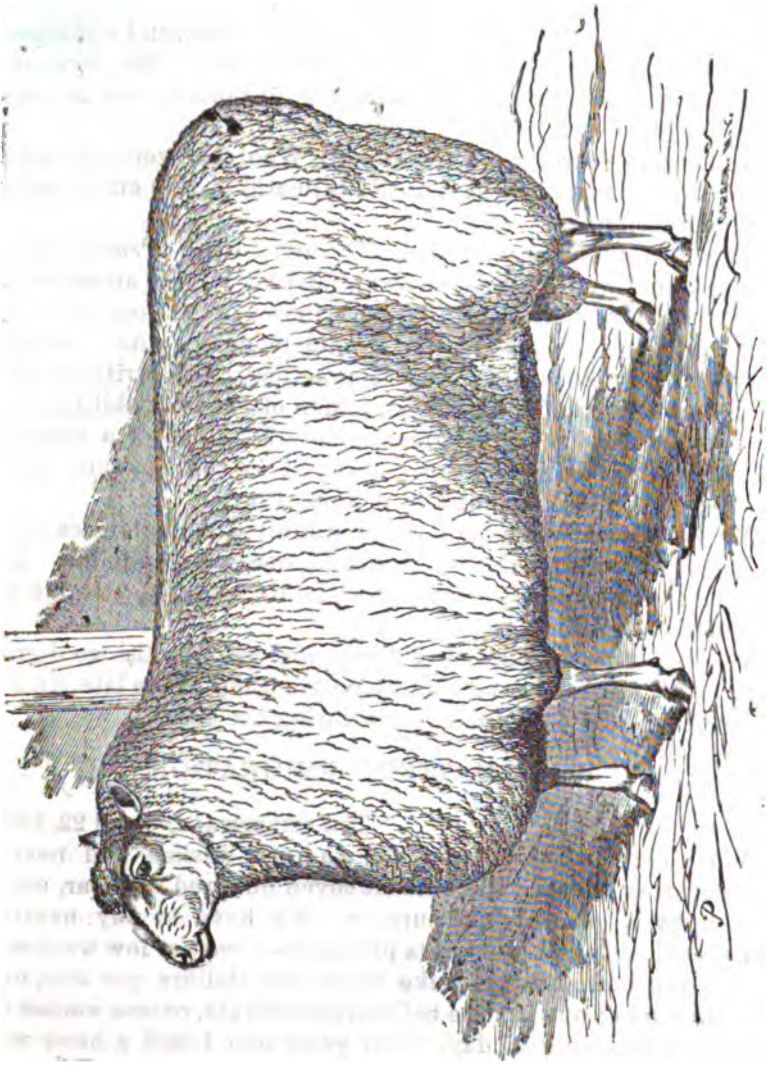
The following articles, of real practical value to the wool-growers of the State, are selected from the contributions of the late Mr. Boardman to the *Journal of Agriculture* during the year:

WOOL MATTERS—EMIGRATION.

The Sheepwalk, June 22, 1868.

Since I sent off to you my last, we have washed and nearly finished shearing sheep. Have about seven hundred to shear, and hope to finish by Wednesday or Thursday. We have to pay nearly war prices for shearing—eight cents per head—however low wool may be. Some of our best shearers make their four dollars per day, even in first rate flocks; and in bare bellied, second rate, coarse-wooled flocks, shear sixty to seventy a day. Two years ago I had a hand who, on leaving my shearing-floor on the fourth of July, had shorn that season over twenty-three hundred sheep, and was expecting to shear a week longer. He commenced the season in Missouri with common "native" sheep, which are generally shorn quite early, and had followed flock after flock into Central Illinois.

Wool is coming off lighter than I knew it to in this State. One



IMPORTED COTSWOLD RAM—"HIS ROYAL HIGHNESS."

Bred by Robert Garne, Aldsworth, England. Imported by and property of Burdett Loomis, Windsor Locks, Conn.

great reason for it is the many heavy, beating rains of the spring, which had thoroughly washed our sheep before we put them into the water. I gave all my sheep *four* good swims across Deer Creek, and being anxious to get the sheep out of the way on account of other work, commenced shearing in seven days, although the weather was so cool at the time that the oil had not raised a particle. Wool shorn thus early has a harsh feel, a fibry look, and grayish tinge which do not appear when the oil has started into the fibre. Although the wool is light, yet my sheep are *woolier* than I ever knew them; my young sheep covered from forehead to hoof.

We do not, these days, look for Eastern buyers to visit us and buy our clips at the barn, as they did previous to '61. There appears to be a kind of understanding among them that they shall not go beyond Chicago to buy Western wool—they prefer that we should send it clear down to them.

In the olden time we used to bulk our wool in the barn, ranking it up with passages between ranks so that a buyer could more thoroughly inspect it, and wait for them to come round. Now, we sack as soon as sheared and ship.

As soon as sheared, my clip will be sacked and on the road to Reynolds, Reed & Co., Chicago. The wool-growers of Illinois look upon Mr. Reynolds as almost one of themselves, and know the man better than they know your correspondent.

It looks, at the time of writing, as if they wished to buy Illinois wool in a range of thirty-five to forty cents. It is no use guessing how the market may turn, but at thirty-five cents, only blanket lots, mixed lots, etc., will be likely to go to market. The local dealers of my county town are paying but thirty-five cents per pound for the best. They get, of course, only small lots of men who, not making wool a speciality, dispose of what little they have to sell immediately after shearing.

Some of our large flocks have already started, since being shorn, for Southwest Missouri and Southeast Kansas; others will get on the road in a week or two. Our principal highways are beginning to be lined also with movers' wagons bound for the same section.

Did you ever think that it is not the East that emigrates and settles the West, but the West settling the West? Where one New England Yankee picks up his traps and puts out for the far West (after talking, and writing, and consulting books and newspapers, and travelers, and maps, and after trying to get a colony to go along with him to keep the bears off), a hundred Buckeyes and Hoosiers and Suckers will put out some bright morning before their nearest neighbors have learned that the "notion" has "tuck" 'em. Moving, to a Western man, seems like a small affair. And having already "improved', one Western farm, on moving to a still newer country, they unload their wagon, start a shanty, set a breaking plow to running, and have a team started to the nearest timber for poles for a "Shanghai fence," before the New Englander has got done mediating on his courage in pushing off from home and friends into a Western wilderness.

However, "use doth breed a habit in man," and the *Suckers* say that some Hoosiers move into Illinois and back to Indiana so frequently that they can borrow meal anywhere on the road, to be paid when they move back again. That story with regard to their chickens coming up and crossing their legs to be tied whenever they see the wagon sheet being bent on, I can't wholly believe.

About nine-tenths of the sheep-men of this section would like to sell their sheep at from $1 to $1 50 per head, and buy yearling steers at $30 per head; in two or three years' time some of the same class will be trying, perhaps, to sell yearling steers at $15 per head to get money to buy sheep at $4 to $5 per head. So we go; when things are their lowest, it is only a very small class of shrewd men who see that such stock is the sort to buy. S. P. B.

WHAT SHEEP TO BUY.

As it is altogether probable that many men in Missouri, who have had but little or no experience in sheep handling, may have it in view to purchase sheep next spring or summer, I have thought it would be a good plan to give them a few hints on how to buy, and what kind of sheep to buy, together with a few of the mistakes which inexperienced men are apt to make.

In the first place, nineteen men out of twenty of this class always think they ought to have just twice as many as they can handle well. In noticing the action of our "new sheep men,"—*i. e.*, men who have pitched into wool growing without any previous experience in sheep, I find that they wish to start with just as large flocks as the old hands at the business possess, those who have been engaged in it from sxteen to thirty years. They can't see why, if A can manage two thousand head, B three thousand head, and C from six to ten thousand head, they cannot do the same. Now if they would go back and look up A, B, and C's early history, they would find that the individuals named commenced the sheep business with flocks of from two hundred to one thousand head. In my acquaintance with the oldest and most successful sheep men of Central Illinois, some of whom have a national reputation as flock masters, I can think of but one or two whose start in sheep was as high even as one thousand head.

Among men who have had no previous experionce in sheep, there are but few who ought to commence with over five hundred head, and one thousand is the extreme limit to which a new sheep man's flock should reach on the start. Some men think that if they can only hire a good shepherd, they can start with a considerably larger flock than otherwise. This is partly true; and yet, though a good shepherd is a good thing, a good owner (who knows his business) is a much better thing. Another thing I have noticed is, that a good shepherd is a much better shepherd when hired to a man who is himself a first rate shepherd, than when he may have "shepherded" for one who knows but little about sheep.

With the new men who have "pitched into" sheep in Illinois and Iowa during the past five, six, or seven years, and who are now "pitching out," or trying to, as fast as they pitched in, next to the great mistake of buying too many sheep, was the *quality* of those they bought. Going into Michigan and Ohio at a time when the sheep fever was up, they could buy scarcely any sheep but "culls," which a man had better never buy. For those who may not know, I will state that culls consist of old sheep, spoiled bagged sheep, light shearing sheep, ewes which have proved themselves poor nurses, ewes whose lambs somehow always die about as soon as dropped, poor bred sheep, and late, unthrifty lambs.

Flocks of this description were driven about twice as fast as they should be, many of them arriving at their destination late in the fall, worn down and poor. Sheep should never be driven anything of a long journey except in the spring, or immediately after shearing, so as to get to their destination in good time to recruit on grass before winter sets in. If sheep are worn down and poor at the commencement of winter, all the grain in the world won't save them. Many bought their start in sheep of flocks which were driven West as a speculation; in such case they bought all the evils above mentioned intensified.

In buying two flocks in Ohio, one in 1852, and the other in 1857, I always got the privilege of throwing out a specified number from each lot purchased. As neither of those were excitable years in sheep, I could not only do this, but also take my choice in lots of sheep for sale. At that time, those who had a lot of ewes to sell used to let them go unbred in the fall, so that if not sold the next season to some man for stock sheep, many of them might be turned off with a lot of wethers for mutton. I bought dry ewes altogether, because they were in better flesh and would drive better than nursing ewes.

The best sheep for a man to buy who is just starting a flock, are young two and three year old ewes. Next to such, I should prefer to buy yearling ewes, although having to wait a year longer for increase. I consider it poor policy, and do not practice breeding yearlings. It will do in small flocks, where yearlings are large of their age, but not in large flocks—of Merino sheep especially. Next to yearlings, I would take a flock of *thrifty* lambs. But there is a very wide difference in the lots of lambs raised by different owners in the West, owing much to the manner in which they have been treated. The sort I should *not* want are those which were dropped in May, June, and July, which were not weaned early enough, or not given a good chance at weaning, or even in some cases which have not been weaned at all, any further than the ewes weaned them. Although four and five year old ewes are not objectionable, if right other ways, yet there is, in general, *nothing like young sheep.*

A man who is unacquainted with sheep should, on proposing to himself to buy a flock which may have been driven in to sell, for instance, take with him some man who is posted on sheep. A sheep man, on coming up to such a flock, will take a general look over it to note condition, thrift, quality of wool, etc. He will then wish to have them up in a yard, where he can catch them, to make more particular examination. He catches a lot of the oldest appearing ones and looks in their mouths; he watches sharply for any indications of scab (small patches of wool gone), and makes a rigid examination with his knife of the hoofs of such as limp the least bit or show any tenderness in their feet. If any of the hoofs have been treated for foot rot at any time within six months, he is sure to see it; it shows either in the growth of the edge of the hoof from its former paring with the knife, or in the rough and unnatural hardness of the hoof which the application of all foot rot medicines (caustics) leave. A new man should never buy a flock which indicates that it has been treated for scab or foot rot. They may be cured, but he is not the man to risk it. Nothing sickens new men like having to go through a siege of doctoring a diseased flock. I dwell on the importance of guarding well against foot rot and scab, because half the flocks in Illinois and Iowa have got one or the other, and some one is going to get badly sold in Missouri next summer. What I fear most is, that enough flocks of this description may get into Southwest Missouri and Kansas to infect the whole country.

Buy only good sheep, if you can't buy so many of them. Of all the profitless stock, a hard lot of sheep is the most so. One thing I forgot to mention above, and that is, in buying sheep in the summer or fall, to try and learn whether they have had bucks running with them. One of my neighbors bought a flock in such condition last fall, and has had two hundred or more lambs drop this winter, not one of which is alive at this time. In addition to the loss of the lambs, many of the ewes have died from weakness in lambing, and of those which live through, many of them will shed their wool, and all shear but light fleeces. Don't buy ewes out of a flock driven in from a distance which have had bucks driven with them, even if they have been aproned. Aprons will slip sometimes, and, as we have heard, "accidents will happen in the best of families." S. P. B.

MARKETING WOOL.

Within a week or two past, I have been receiving letters from ferent correspondents, asking my opinion whether it is best to shear without washing sheep, where to ship wool, to whom to ship, etc. With regard to the first query, I have answered that, for two years past, those wool growers in this section who shipped their unwashed clips to New York and Boston, made better sales than those who washed their sheep. The most of Central Illinois unwashed wool sold in New York, take the season through, last year, at from thirty to thirty-three cents per pound. The range for washed Illinois wool was from forty to forty-five cents, but little selling at this last figure. These figures, mind, were from what the commission merchant and the manufacturer, jointly, were agreed to call washed. Men sending washed clips to Eastern markets—every fleece of which was washed, and washed equally well in all respects—find that a large per cent. is "thrown out" as unwashed, and on which 33⅓ per cent discount is made. Neither the commission merchant nor the manufacturer would assert that all, or even a greater part, of these fleeces were never washed, but that many of them are "too heavy." When it comes to this, it is plain to see that men might differ very much in what made fleeces too heavy. In some cases, perhaps, too much grease might make a fleece too heavy—although free from dirt and entirely unobjectionable in other respects. I have seen wool-buyers who considered certain fleeces too heavy entirely from their notion of things; for instance, from having made up their minds that certain fleeces of certain qualities of wool ought to weigh only so much to the fleece. I remember well, fifteen to twenty years since, when wool-growers in Ohio were compelled to split fleeces of five pounds weight (of as pure and clean wool as was ever put up), on account of the settled convictions of the wool-buyers of that day that no fleece of fine wool ought weigh much over three pounds.

When it comes to the business of "throwing out" my clip, according to the notions of a commission merchant whom I never saw, and whose commissions and charges are a "dead sure thing," jointly with the notions of a manufacturer whose visits to his wool lofts it is the interest of the commission merchant to secure, you see it is a very vague standard for me to go by, and that, no matter how light my wool, I can never make any calculations on how it will come out. I have never shipped more clips than I was compelled to. In former years, when manufacturers sent their agents West to buy wool, I always sold at my barn. In those days I watched the quotations of Western wool in the Eastern papers, and then said to myself. the whole expense of shipping, all told, is not less than five cents per pound, to say nothing about interest on the money, risk, uncertainty of the market, together with the delay in settling my yearly bills. Looking at it in this way, I always sold at home, and was satisfied that I did much better than to ship. Since 1861, however, the manufacturers have compelled us to carry our wool to them, which, I doubt not, they find to be a more excellent way. It is easy enough to say that it is to the interest of a commission merchant to make the best possible sales for consignees, in order to retain his customers and induce new shipments; but it is much of a piece with what manufacturers used to tell us about the mutuality of the interests of wool-grower and wool manufacturer, in those old days when they were always trying to get tariffs enacted in which foreign woolens should pay large duties, but foreign wools come in almost free. In the wool-commission business it is fully as important that manufacturers should feel it desirable to look in at his lofts quite frequently—especially since it so happens, from this cause, or some other, no wool-grower, scarcely, sends his wool to the same house for over two consecutive years. Like the boy who would not say that millers stole, although they did have fat hogs, I will merely say of the commission business that there is everything in it to make a man steal, if he does not hold in hard. He has my property wholly in his possession, and can make me what returns he pleases, and I have to take them. I would give a very pretty little sum were wool bought every day in the year by as many different buyers, in all our small country market towns, as buy corn, wheat, fat cattle, fat hogs, and the other great staples of the country.

With regard to Eastern markets, I have always found that a nicely handled, *even* clip of wool would sell better in Boston than in New York. As to whom to ship, the only way is to get the best information obtainable from wool-growers whose clips different wool-houses may have sold.

Anywhere in Illinois or Missouri, sell at home, if you can get within five cents per pound of what your grade of wool is quoted at in New York.

S. P. B.

THE WOOL MARKET.

Sheep grow less in numbers in our State (Illinois), every day. Many of our large flocks are putting out for Southwest Missouri again this fall.

Have just got a letter from a Sangamon county friend saying that he was going to cross the Mississippi river at Alton on that day with seventeen hundred ewes, on his way to Southwest Missouri. He already has nearly as many in that section of country, sent there a year ago.

During the summer—and in fact for a year now—every thing which could be called, by a slight stretch of imagination, mutton, has gone forward to market. Central Illinois has not been so cleaned out of "feeding sheep" in ten years. Flocks consist now of ewes—and only small ones—and yearling wethers.

Good mutton sheep will be scarce and high next March. The wool market is doing better every day, and it looks as if next year's Illinois wool might bring fifty cents per pound. I speak of Merino;

combing wool brings that now. Combing wool has received quite an impetus during the last two years from the operation of our tariff. If our long-wool men don't look sharp, things are cooking which will set them quite a lick back. Various parties are trying to get up a new reciprocity treaty with the New Dominion, under which, it is altogether likely, Canadian wool (which is almost entirely combing wool) will have the use of our markets duty free. As is well known, at present, the New Dominion stands on the same footing with other foreign countries, and her wools coming into our markets pay a specific duty of ten cents per pound and *ad valorem* of—how much I never think worth stating. The ship-building and other interests of New England, importers, free-traders, and I much fear, the manufacturers of woolens think a reciprocity treaty with the New Dominion would be a good thing—the latter much more so, provided "raw materials" could come in free, but manufactured articles *not*. I discover that the manufacturing interest is wholly of the opinion (strong tariff men, all of them) that the greatest good of a country is to get "raw materials" cheap, so as to work 'em up and send 'em out to the world with the added value, you know! Only way, you know, to compete with other nations in manufacturing! "Sauce for the goose is not always sauce for the gander."

You know I am a sort of free trade man; free trade by nature, but tariff by wool! When tariffs are going, why not let every interest go for the best one there is in the batch?

How does it happen that so many of us strong tariff men wish very much to protect ourselves against Great Britian, and yet are so terribly *reciprocal* towards *colonies* of Great Britain?

However, that is neither here nor there; all there is about it is, that if combing wool comes in from Canada free, our long-wool men in the "States" will find their present high tide of success ebbing very rapidly. Under the present tariff, the long-wool men would increase in a few years sufficient to supply all the combing-wool needed by our worsted manufacturers. The great argument used by manufacturers, who are naturally tariff men, has always been that by means of protection you could increase and develop any interest until it could stand alone; and yet many of our worsted manufactures are today, *I* believe, working secretly to help on a new reciprocity treaty, one "plank" of which shall be free wool. How do you like it, you Cotswold, Leicester and Lincoln men? Do you believe that you, with your high taxes and expenses, can grow long wool as cheap as the Canadians, with their light expenses, and their almost no taxes?

Did the Canadians help you to carry on that long four years' war? Are they going to help you pay the bills?

S. P. B.

TIMOTHY HAY FOR SHEEP.

In the *Journal of Agriculture*, of the date of July 11, is a short article headed "Timothy Hay for Sheep," taken from the *Farmers' Chronicle*, written by a correspondent in Southern Illinois, who takes the ground that timothy hay is injurious to sheep in Illinois, but not in Ohio. This proposition strikes me as being a little after the sort of the dictum of the young doctor who, from the widely extended experience of two cases, made the discovery that, in a certain disease, I forget what, mush and milk was a sure cure for a Yankee, but death to a Dutchman.

It is but a few weeks since I was called upon to state how it happened that feeding corn to sheep took the wool all off. Some correspondent had fed corn and found it to do so, and was intending never to feed any more. I have had, too, men tell me that sheep would starve to death when fed all the sheaf oats that could be piled before them. Here, you see, is an alarming state of affairs; one man has learned that corn takes the wool all off, another, that oats starve them to death, and now comes this Southern Illinois man who has learned that timothy hay is rank poison to sheep in Illinois, but the best diet in Ohio. This correspondent says that he fed twelve hundred sheep on timothy hay, one winter, and lost half of them. That all may be true, and yet there be a dozen ways of accounting for his loss beside charging it to the injurious effects of timothy hay, *per se*. For instance, he might have fed very poor hay, and very little of it; or, he might have fed a large amount of very poor hay; or, he might have fed *wholly* hay—which, I judge from his language, was the case; or, he might have fed large amounts of good hay but fed the whole twelve hundred in one feed lot; or, the first winter his flock might have been just off a long journey, whereas, the second winter they had recuperated from the effects of the previous year's drive.

As to sheep doing better in Ohio than in Illinois when fed timothy (or any other) hay, *exclusively*, the difference is just here: In Ohio, even with large flocks, scarcely ever are more than one hundred shed or wintered in one enclosure; then, too, they perhaps have the benefit of good sheds, racks, care, and, perhaps, are fed three times a day *with the best of hay*. Now, unfortunately, it so happens that in Central Illinois there is but a small part of the hay crop cut and cured as early, or as well, as it ought to be; and, from what I know of Southern Illinois, I don't think it is at least any better in that section. Suppose, now, you take twelve hundred sheep which have been fed one winter by separate hundreds on the best and brightest of timothy hay, throw them all together into one enclosure and feed them on the ground, in the mud half the time, with coarse, dead-ripe, weather-beaten hay, and can't you see that timothy hay might be "very bad stuff" for sheep?

However, in these days, it is considered very poor policy, in any

State, to feed sheep, whether few or many, *exclusively* on hay. Here in the West it won't do at all; and the man who tries it with a large flock will make great losses—not because it is *timothy* hay, but because it is *hay*.

I am now cutting, and shall have to feed the coming winter, perhaps two hundred tons of hay. I have fed thousands of timothy hay to sheep, not for one or two but for seventeen years. I have yet to learn that they were ever injured—except for the want of it.

My favorite plan of feeding large flocks of sheep is, to have board racks standing in all my feed lots, keep them stuffed with good, bright timothy hay, and to roll out in addition a big feed of shock-corn once a day.

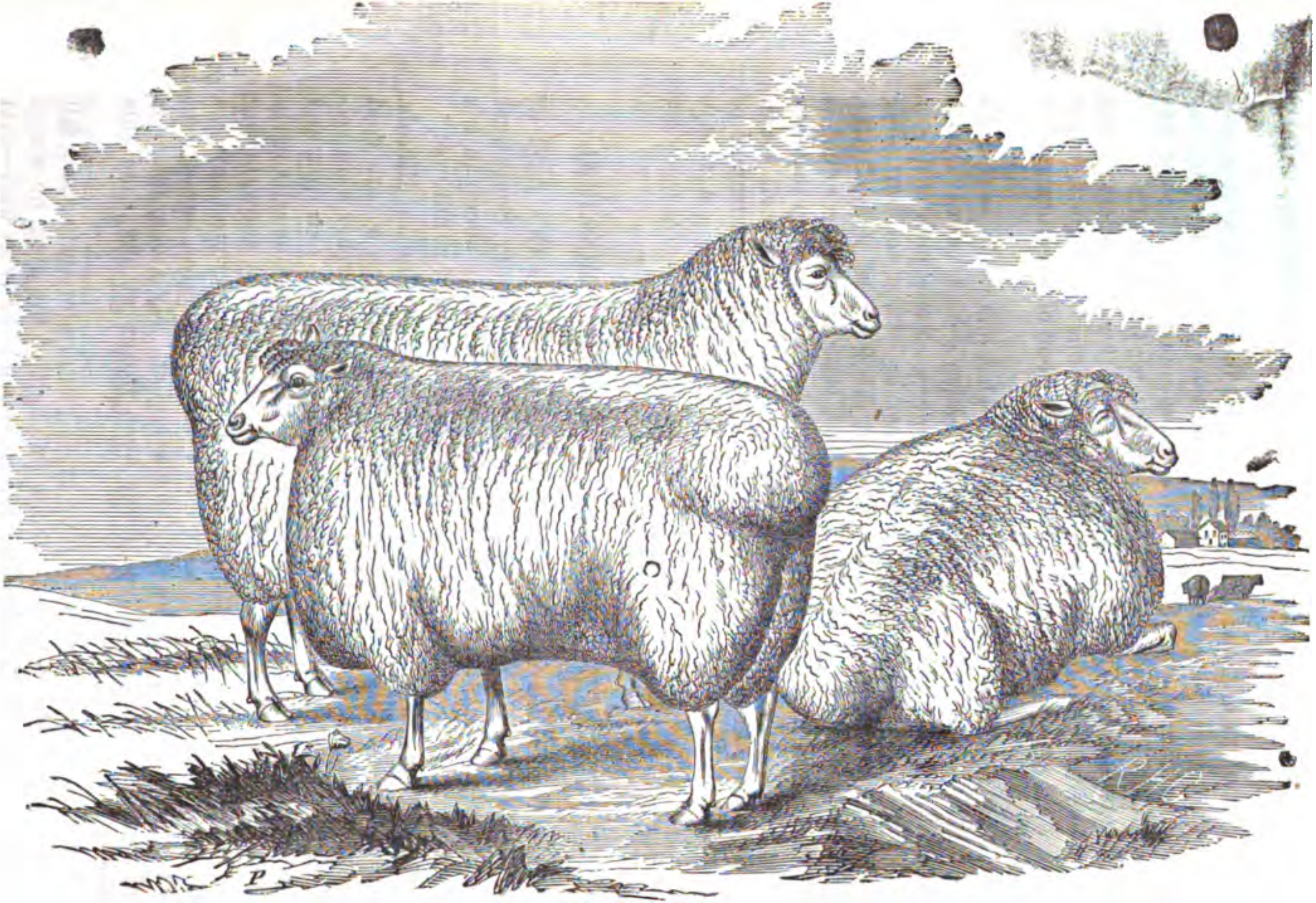
It does not make so much difference what one feeds, so that he commence feeding early enough, feeds enough of it (always with some kind of grain), and feeds with judgment. Some men will put off feeding in the fall till the severest weather comes, roll out a big feed of corn without having accustomed the flock to it gradually, founder a big lot of sheep, which all shed their wool, then swear it won't do to feed sheep on corn. Another man starves sheep to death on poor hay, and lays the blame on timothy; he might as well claim that the reason they died was because his feed-rig was not framed of sassafras poles. S. P. B.

COST OF KEEPING SHEEP IN SOUTHWEST MISSOURI.

Mr. J. W. Fenton removed from Central Illinois with a flock of sheep in the fall of 1867, and located in Lawrence county, Southwest Missouri. On being inquired as to the cost of keeping sheep in his new location, as compared with Central Illinois, replied as follows:

The winter has been much milder than it is in Central Illinois. To be sure we have some cold snaps here, but no such severe cold weather as is experienced further North. Our cold weather here seldom lasts longer than three or four days at one time. Our first and coldest weather came on us in December—that being unusually early for this latitude. We then had about three inches of snow, laying about eight days; since then we have not had the ground covered with snow this winter. We have had a very dry winter, having had only two days rain since the first of November. My stock water is supplied by a spring, and has never been frozen at any time this winter.

A man well provided with blue grass pasture for spring and fall feed, can winter sheep here on about one-half of the grain he would require in Central Illinois, and winter his sheep equally as well—that is, if the sheep have been kept here during the summer. Sheep that have been driven from Illinois or Iowa, and get in here the latter part



IMPORTED COTSWOLD EWES.

Bred by Robert Garne, Aldsworth, Northleach, England. Imported by and property of Burdett Loomis, Windsor Locks, Conn.

of the summer, will require more grain the first winter than those will that have been here all summer. If I were to drive a flock of sheep from Illinois to Southwest Missouri next summer, unless I got them here in the early part of the season, I should expect to feed them but very little less than I would in Central Illinois, in order to get them through the winter in good condition, because I should commence feeding grain the first of December, and feed right along, no matter how good the grass might be; but sheep that are grazed here all summer require no feed before the first of January.

You can, therefore, judge for yourself whether sheep husbandry can be made more profitable in Southwest Missouri than it can in Central Illinois.

INFLUENCE OF CLIMATE ON THE GROWTH OF WOOL.

During the past four years I have made extended inquiries of wool-growers and others, in this State and to some extent in Kansas, by circulars and at personal interviews, in regard to the effect of our climate upon the fineness of wool. The almost invariable response has been that no perceptible change had been or could be discovered. A different opinion, however, seems to be prevalent in many Eastern localities. I listened to the discussions at the New England Fair in September last, and heard the statement, from the President in particular, that in the Western climate the wool becomes coarser. He said that they, in New England, could not compete with the West in producing beef and wool. It was impossible. But they must depend upon raising fine animals to supply the stream constantly going West, where the lack of skill in breeding and the deteriorating influences of climate prevented them from raising animals of fine quality and maintaining the fineness of wool in sheep.

I think it may be safely said that the foregoing statement does not agree with Western experience. Henry S. Randall, L. L. D., author of several works on Sheep Husbandry, editor of the Sheep and Wool Department of the *Rural New Yorker*, and the best authority on the subject probably in this country, published in the paper named, a few months since, an article from a foreign publication on the subject at the head of this article, with his own comments thereon. It is here given entire for the purpose of bringing the important subject prominently to the attention of our wool growers, as well as for the valuable facts contained. It is as follows:

"The following article, from the London Agricultural Gazette, presents some rather interesting views on the subject, on which it treats, though we cannot subscribe to several of them. We do not, for example, believe that the fineness of wool is to any essential extent, regulated by the size of the pores in the "upper skin." This theory is not sustained by any practical facts which as yet have been made to appear—at least, so far as we know; and the objections to it are numerous, and, in our opinion, unanswerable. We have not time, however, to present them here. We attribute the fineness of wool to blood—or "influence of parentage," as the writer in the Gazette terms it—modified chiefly by the course of breeding to which the sheep is subjected. We will not assert that the influence of climate in keeping the pores—if the openings in the skin filled by wool or hair can properly be termed pores—either open or contracted, exerts no influence whatever; but we think this influence is very inconsiderable, and scarcely of any practical consequence compared with the others which we have named.

This pore theory was once so prevalent that the impression prevailed that extremely fine wool could not be grown in warm climates that it would inevitably grow considerably coarser in them. Moderate experience has proved the fallacy of this view. Exquisitely fine wool is grown at latitude 30° in Australia, the Cape of Good Hope and South America; and this corresponds with the latitude of Texas and the extreme southern limits of our Gulf States. Far finer Merino wool is grown on the scorched plains of Australia, than in our Northern States, more than ten degrees more remote from the equator, and vastly colder, in climate. The finest Merino wools of the United States, "Washington county wools," as they have been designated in commerce, are grown in Southwestern Pennsylvania, Southeastern Ohio, and the Virginia "pan-handle" between them; while most of the Merino wools of Vermont and New York, where the average temperature is essentially lower, do not rise above medium Merino.

This appears to be the fact the world over—or wherever the Merino sheep flourishes—that the wool of the breed is fine in proportion as fineness is sought, i. e., *bred* for. It is not, as a general thing, extremely fine in Vermont, New York and our other most Northerly States, because the growers in those States prefer to grow it coarser; while in the hot foreign countries we have named—which, according to the pore theory should produce an essentially coarser staple—a materially finer article is produced. There is not a Merino growing country in the world where the fineness does not depend essentially on the course of breeding pursued, almost totally irrespective of climate. Nor is there such a country in the world where, if the coarsest and finest sheep of the same flock were separated into two flocks and each kind bred by themselves—the coarsest rams with the coarsest ewes, and the finest rams with the finest ewes—and this system of breeding and selection kept up for a few generations, in which the two flocks would not exhibit so great a difference in fineness that their wool would not be applicable to the manufacture of the same fabrics. Blood lies at the foundation of all qualities; but breeding is the great agent which controls their modifications.

Climate, however, is claimed sensibly to affect another valuable quality of wool, namely, its softness and pliancy. And here the warm climate is supposed to possess the advantage over the cold. We are inclined to credit this theory—but how far this supposed influence is exerted, we are not prepared to say. Exaggerations in regard to matters to which it is so difficult to apply practical tests, are amazingly common, even among practical men!

One of the ideas advanced in the article below, will, we think, call forth a smile from all experienced and well informed sheep breeders. The writer says: 'The influence of climate is very forcibly shown in the necessity, which is so well recognized, of going back to the original district of any special breed for fresh stock to maintain their distinctive character.' Think of Germany, Australia and the United States, going back to Spain, the 'original district' of the Merino for 'fresh stock' to maintain the character of their flocks! A cross with the best Merinos now in Spain would deteriorate the medium quality of Merinos in any of those countries. This is not a mere unsupported assertion, like so many of the declarations of the writer in the London Agricultural Gazette. We have proved it on a former occasion by abundant and reliable testimony.

Natural history is full of traditionary theories, speculations, 'whim-whams'—originally started by writers of some supposed authority, and popularly adopted in default of better ones, or because investigation had not then pointed out the true facts in the premises. And these theories are repeated and repeated by succeeding writers, until the most absurd ones come to be regarded as axioms. How preposterous the idea that the Creator has so constituted the world that varieties of animals, of the greatest value to man, can only be raised in their perfection, in their limited 'original district'—owing chiefly to the 'influence of climate.' Climate, soil and other natural circumstances, and accompanying artificial treatment, do unquestionably do very much to mould the characteristics of breeds or varieties, but would it have consisted with benevolent Omnipotent design to limit the capacities of this world to produce any of the most perfect objects of utility to any one exclusive 'district?' And what is the *general* evidence of facts on this question? Can Cotswold, South Down, or Lincoln sheep, or Devon, Hereford or Short-Horn cattle, be grown nowhere else in England or in no other country, in perfection, except on those little patches of English soil where these varieties originated? The same kind of question is applicable to all brute animals, and even to man. According to the theory we are combating, all varieties of brutes and men, not indigenous to or originally formed (as varieties) in the United States, must deteriorate or run into new varieties. The Abbe Maury, a French writer of standing, did contend that European men degenerate physically in our country! These vagaries are not worth notice, except in so far as they effect practical action—and we suppose there is little danger of this, in respect to our sheep. But in this hasty and superficial review of the articles under consideration, we could not resist the temptation of giving one kick at this relic of 'old fogyism.' And now for the article itself:"

"In the growth of wool, which is a natural protection of sheep from the inclemency of the weather, we may reasonably calculate upon the influence of climate being somewhat important, and such is generally the case. The laws which regulate its growth appear to act so that the circumstances which render certain modifications in the wool desirable also favor their production.

The first and most evident influence of climate upon wool is in its control of the fineness of the staple. This is of course regulated by the size of the individual fibers of the wool, and we shall have occasion to show that climatic influences have a very important part to play in determining their size and general formation. Springing as the wool does from a little sac or vesicle placed beneath the upper skin, through which it has to penetrate, it is clear that the aperture through which it passes acts as a sort of gauge, and determines the size of the fiber. If this gauge remains constantly of the same size we should have a wool produced consisting of fibers of equal diameters, and therefore of equal degrees of fineness. These gauges, however, are not constant in their size, and various circumstances influence the result, to which we shall briefly advert.

The influence of parentage clearly precedes all other agencies, and decides the preliminary conditions of the growth of wool. It is true that these preliminary conditions are subject to modification by other agencies, but they still constitute the foundation upon which they act. We cannot, therefore, safely neglect them, nor deem them unimportant simply because other circumstances re-act upon them. We should rather secure the preliminary conditions as fully and as favorably as possible, and then protect them from prejudical influences with jealous care.

The circumstances which most powerfully affect the size of these apertures in the upper skin, through which the wool has to pass, are variations of temperature and the condition of health. The influence of climate is generally operative through the former of these, but in many instances, when the change of temperature has been extreme, it affects the conditions of health, and both come into play. The warmth of the skin is well known to regulate the size of the pores of the skin. These become more open in warm weather than in cold, and in like manner the apertures through which the wool passes becomes of larger diameter with increase of temperature. As a consequence of this we find the fiber of wool is always produced of a larger size when the temperature increases, and of a smaller size when it lowers. To a great extent this is controlled by the growth of wool already existing upon the sheep, which protects the skin from any sudden variations of temperature to which it would otherwise be liable.

This protection, however, whilst it modifies the influence of these changes of temperature, does not set them aside. They are still very powerful in their influence upon the growth of wool; and when the sample of one district, possessing a higher average temperature, is compared with a fine sample of another district in a colder climate, it becomes very evident. It is perfectly true that much may be done by good management to keep down the temperature in the summer months, and to protect from the cold in the winter, and thereby secure a greater uniformity of warmth throughout the year, which must be accompanied by a growth of wool of more uniform size. We shall, however, find that, whilst we cannot act independently of these influences, we can, by judicious management, prevent any injury to the wool. The fineness of the sample, must, of necessity, be much under the control of the climate, but we can still prevent violent changes of temperature acting upon the skin, and thereby we can avoid those sudden variations in the size of the fiber which give it such irregular strength. Thus, while certain districts will retain a general character for the class of wool produced under good management, that wool will be grown with such regularity in the size of fiber that its strength shall be fully preserved. It is the weakest link in the chain which indicates its strength, so also is it the weakest point in the fiber which determines its liability to fracture when in the hands of the manufacturer; and it is to avoid these weak points that it becomes incumbent upon the flockmaster to decrease any variations in the temperature of the skin, as much as he possibly can.

The quantity of rain falling in any district is another powerful agency in its influence upon the quality of the wool. This is, of course, much less injurious where the soil happens to be dry and porous, and on the other hand its influence is most prejudicial when the soil is of a retentive character. The value of a dry lair for sheep is invariably acknowledged, for when once they get wet, and are kept under its chilling influences for any lengthened period, the foundation is laid for a derangement of the health of the animal, and this is utterly inconsistent with the successful growth of wool. We notice, however, that the wool grown in wet districts is better adapted for carrying off the large quantity of rain thus falling upon them. It is a natural provision for assisting in the protection of the sheep of our rainy districts; and so far it is very valuable and important, but it seriously affects the quality of the wool, especially in respect to its felting character.

The influence of climate is very forcibly shown in the necessity, which is so well recognized, of going back to the original district of any special breed for fresh stock to maintain their distinctive character. However great the care shown in their management, the original type is modified by the influence of local circumstances, and in no particular is this more evident than in the character of the wool. It is one of the earliest indications of a loss of the essential characteristices of any breed of sheep, and the necessity for correcting it arises as much from the importance of maintaining other features of character which would soon disapper, as for the sake of keeping the growth of wool up to the accepted standard of quality. We cannot, as yet, give any satisfactory explanation of the causes which render this necessary, but of the fact there is no doubt; and very much of the influence thus acknowledged may clearly be attributed to the special action of the climatic agencies which are exerting a constant influence upon the sheep of the district. We must not look upon the living animal simply in relation to any one product, however desirable that may be; but we must consider it in relation to all the functions of life. Thus a certain type of animal being produced under certain given conditions of climate and soil, and subsequently removed therefrom to a different climate, does offer many difficulties for maintaining the original typical form in all its perfection, because of these powerful variations in climate. Practically, however, we cannot materially modify these variations in climate, but we may meet them by introducing stock from the original district which possess in full force the distinctive features of the breed.

To judge fully of the influence of climate upon the growth of wool, we must take a wider range than that afforded by our own country, for although we shall find the same laws holding good in different districts of England, we shall not find the variations produced so marked in their character. Thus we find sheep, which before exportation carry heavy coverings of good wool, yielding after a few years a sample of a totally different character—the staple gradually becoming thicker, harsher and coarser, and steadily degenerating into hair. This change may not be fully attained in the fleece of the same sheep, but the succeeding generations will each become more and more distinguished in this respect. In our own country we have forcible examples of the influence of climate in the tendency of wool to become kimpy when sheep are taken from lowland farms into more hilly districts, illustrating the same predisposition for wool to assume a hairy character under the influence of climate.

"HOW TO MAKE OUR FARMS REMUNERATIVE AND ATTRACTIVE."

BY W. M. KING, OF ST. LOUIS.

[Read at the Annual Meeting of the Indiana Horticultural Society, January 7th, 1869.]

Ladies and Gentlemen: Having no pecuniary object in view, or axe to grind, I shall endeavor to state such facts as have come under my observation relative to the subject matter of the following essay which I have *essayed* to produce. It is not to be expected that I shall be able to bring as full sheaves of important agricultural and horticultural truths as may have been repeatedly brought to your ample winnowing and threshing floor by some intellectual Boaz! Nevertheless, if I succeed in collecting a few grains of practical suggestions from the ever broadening fields of inquiry and intelligent research, I trust I shall not be deemed a *Ruth*-less invader.

If I understand the object of this meeting, it is to compare notes and listen to the testimony of *practical working men* relative to Horticulture and its collateral interests. You do not come here to listen to essays copied almost word for word from acknowledged standard works, and which have been still further *elaborated* until the ideas contained therein become as intangible as mist, and seem to be as nebulæ in the farthest perspective! In fact, if the premises which some of our theoretical agriculturists and horticulturists assume, had the small pox, their conclusions would'nt catch it! Many of our most practical men are becoming tired of this state of things. The fact is notorious that men who are pecuniarily interested in some grand discriminating scheme, join these, and kindred associations mount some velocipedian hobby, such as, White Willow, Rhubarb,—Peach on the Plum—half standards, periodicity of the flow of sap (to the brain of course, excepted!) and Jehu like, ride down all candid opposition and deluge the community with a flood of new untried things, greater in quantity than the aqueous particles in the time of Noah! In the good old times of our grandfathers, it was very generally supposed that the motive power which actuated a man could be found within the region circumvented by his waist-coat. But this does not seem to be the case now, for when we see a man in one of these societies assume the *perpendicular*, we involuntarily propound to ourselves the query—from whence do these remarks originate? and are they not connected with the prospective contents of an article manufactured expressly for reception purposes—from the skins of those domestic quadrupeds which are not permitted to attain to years of ox-hood?

HOW TO MAKE OUR FARMS REMUNERATIVE.

The first move in the right direction is to reduce the area of superficial surface cultivated, and increase the producing capabilities of the soil by deep and thorough cultivation and pulverization, and by the application of manures adapted to the wants of the crop designed to be grown. "In England there are many farmers who more than support themselves and large families on the products of six acres, besides paying heavy rents. Agriculturists in Germany, who are proprietors of six acres, support themselves on two, and lay up money on the remainder." In order to make our small farms successful the soil must be worked deeply, and in the variable climate bordering on the 39th parallel—(a veritable battle ground of the elements) where we are so subject to extremes of flood and drouth; *deep* and *thorough* culture is actually indispensable as the most essential element of success. This is especially true, of the region lying south of the 42d parallel. North of this parallel, the frost penetrates the soil to a great depth during the winter months, which by force of expansion loosens and areates it, allows the warm spring rains to penetrate the soil readily which forming pores, admits to a considerable depth the free circulation of warm air, which results in producing a speedy growth, and exert a magic influence in bringing forward, and hastening maturity of the crops. While on the other hand; in the region of the 39th parallel we have an undue amount of rain, without the influences of deep freezing, the attendant result is, perpetually packing, instead of loosening the soil.

Thus it is that on our stiff clay soils that every year of cultivation on the four and six inch plan results to the disadvantage of the cultivator. South of the 36th parallel, however, the winters are so mild, that during the intervals of warm weather the wheat plants and other grains of a similar character make such a vigorous growth and warfare against the elements, that by spring they are thoroughly established and the time of their maturity hastened. Hence it is, that we hear of the farmers of Northern Mississippi turning their attention to wheat raising, and sanguine persons are predicting that it will become the greatest grain growing State in the Southwest within five years. It is said that the Mississippi farmer can have his wheat in the market in June, and have his money in his pocket in time to buy out the cotton planter's farm and stock in the fall at the sheriff's sale."

On or near the 39th parallel, however, the soil must be more deeply worked, first, by loosening the subsoil, by running a subsoil lifter or plow in the bottom of the ordinary furrow. This, in connection with a judicious rotation of crops, including, first of all, clover, and the application of all the manure that can be made economically available, will be the John the Baptist, heralding the incoming of a better dispensation, and the small farmer will soon be able, by reason of the increase of his crop, to thoroughly *underdrain* his land, which will prevent surface washing, lengthen the season for labor and vegetation, prevent freezing out, warm the soil from 10 to 15 degrees, hasten the planting season 10 to 12 days, so that by fall the crop will be sufficiently matured to withstand the early autumnal frosts. In addition to this course of culture, the *thorough and complete pulverization of the surface soil* is absolutely necessary, 1st, as a means of making the plant food in the soil *available;* 2d, as a means of preventing the rapid evaporation of moisture from the surface during severe drouths, at which time, it is a well known fact, that capillary attraction is being carried on in a ratio corresponding to that of evaporation. For this reason we need improved machinery, having a rapid vibratory motion similar to that of the sickle bar in our reapers.

An eminent writer, Horace Greeley, in regard to deep culture, says:

"I hold it demonstrated that the average value of land in tillage is pretty accurately measured by the depth to which it has been thoroughly worked. That is to say: If a farm of one hundred acres, whereof one-half has been thoroughly pulverized to the depth of six inches, is worth $100 per acre—the uncultivated half being worth $50 per acre—making in all $7,500, then the value of said farm would be increased to $10,000, if those 50 acres were so worked to the depth of 12 inches; $12,500 if the depth of soil on the portion in tillage were increased to 18 inches, and $15,000 if it were still further increased to two feet. And I feel confident that in no way can a farmer increase his wealth so rapidly as by increasing the depth of his arable soil. The best practical farmer that I know assured me, three years ago, that he grew twelve acres of good cabbage on an ordinarily subsoiled field, with less than half the fertilizers that he must have applied had he but plowed six or seven inches; while a severe protracted drouth that had stopped the growth of his neighbor's 'truck,' had produced no effect on his."

HOW TO MAKE OUR HOMES ATTRACTIVE.

If effects are the results of causes, we infer that there must be some cause for the rapid increase of the population of our cities, especially by the influx of young men from the rural districts. The first cause doubtless is, that his country home is *unattractive* to him. Another is, that the schoolmaster, as soon as he discovers the premonitory symptoms of talent in one of his pupils, completes a diagnosis of the case, and recommends a profession; and forthwith visions of future greatness occupy the mind of the boy, until he believes, as did Daniel Webster, that the best way to hang a scythe was—on the limb of an apple tree! Still another is, the flaming advertisements of our commercial colleges, who hold out inducements that, if young men will only graduate at *their* institutions, they can easily get situations for them, and then their fortunes will be assured. Fatal fallacy! The result too often is that there is plethora of diplomas, and corresponding diminution of vacancies. Out of employment, he applies to an employment agency, who tickle him and entice him with promises, until his last dollar is gone; then, ashamed to send to his old home for money to return thereto, and lead an honorable life, he too frequently accepts the most menial and degrading employment, becomes a beer-guzzling embodiment of stupidity, loses his self respect, and becomes only a ten pin, to be knocked about, where he confidently expected to make a *ten strike!* The best way to manage a teacher who takes the practical method of showing that his convictions center in, and revolve around, the belief that all wisdom centers in the *law* and *divinity*, and who talks the professions *up* and agriculture *down*, is to request him to about face! and give you a specimen of his Westonian agility as a walkist!

Klippart, of Ohio, says: "Even farmers themselves encourage their sons and daughters to think that there are more honorable, pleasant and easier ways of gaining a livelihood than that of farming. This same class of farmers, however, set no example of learning themselves, or teaching their sons the whys and wherefores of agricultural operations; and surely it is by no means surprising to find young men disgusted with an avocation which promises nothing else than unremitting care, and a dull routine of continued and severe labor. If the son manifests a taste for reading, his parents direct his energies to the acquirement of a profession other than that of agriculture. It is a fact patent to all, that the young men who leave the quiet farm in the country for the noise and din of city life, invariably become the first victims of the vicious and demoralized in the city, and then follow in the footsteps of them who have deceived, betrayed and ruined them. I have made careful inquiry, and make the statement on reliable authority, that the greatest proportion of criminal and vicious young men under 25 years of age, convicted of crimes committed in the city, are those who were reared on the farm until they were 15 or 18 years of age!"

To remedy this alarming condition of things, the old home should be made more pleasant. A few more *books* and *papers*, and a great deal less of unsystematic drudgery, would be a change for the better which would be duly appreciated by the *boys*. Even an occasional day could be set apart for recreation, provided it were explained to the boys that it was necessary to rise a little earlier and work a little more vigorously to accomplish a specified amount of work in a limited time. How much brighter the eyes, and elastic the step, of boys raised in this style, than those under the endless drudge and treadmill system. Then, too, the boys should be consulted—yes consulted! about the work and the various operations on the farm. Indeed, this might be done without outraging the dignity of *pater families*, for in nine cases out of ten, the children so consulted would willingly and affectionately yield to the wiser and maturer judgment of the father. I say, give the boys a chance. Set apart a small parcel of land for them. Let them raise a crop and sell it, and invest a portion of the proceeds in agricultural books and papers. Let the latter be sent to their address, and, my word for it, you will find them apt pupils when you call for them to attend a course of lectures, or become students in your State agricultural and industrial school. If you see any genius in your children for mechanics, sculpture, painting or drawing, don't throw the cold sheet of indifference over their tender and enthusiastic souls, but encourage them every way you can. If neighbor

Skinflint does put his boys in separate fields to work, and induce a competition between them to see which can do the most, do not do likewise. *Once* in a century is as often as we desire to be compelled to look on one of those merciless bipeds who possess the form of man without the essential accompaniment of a soul!

To increase the attractiveness of our homes, we must continually develop our *Horticultural resources.* This was man's primitive employment in the garden of Eden, and to which he must eventually return, if he would restore mankind to the happy condition mentioned as having been in vogue soon after the beginning! In indicating the kind of fruit to be eaten, it was expressly stated to be that in which is the *seed* of the tree. In this connection, recent scientific physiological researches have shown that fresh, ripe fruit should constitute the leading element in the diet of mankind. That food does influence our mental and emotive states, is unquestionable. The history of the world goes to show that the unlimited use of animal food has a tendency to animalize the habits and disposition. This is especially true concerning the flesh of the direct descendants of those animals which, on a certain occasion some 1,800 years ago, when the attempt was made to drive them where they had constitutional objections to going, they, with their inherent obstinacy, ran violently down a steep place into the sea. To hasten the incoming of a more fruit consuming dispensation, the sciences of horticulture and entomology should be taught in our common schools. It is exceedingly important that every boy and girl throughout the length and breadth of the land should become familiarized with the appearance of their insect friends and foes, in order that they may know which to save and which to destroy.

It is only by the combined efforts of the *whole people* that we can succeed in effecting the desired result.

Even *now*, eternal vigilance is the price of fruit, and what will it be twenty years hence, if every careless farmer and horticulturist continue to propagate noxious insects in the future as they have in the past.

I repeat, then, that this association *should* spare no effort to hasten the general introduction of knowledge in reference to insects, and should seek, in every way possible, to call the attention of the public to the vital importance of *entomology!*

In this utilitarian age, the question of—will it pay? has the precedence over all others. It is well that it is so, and that the practical should be considered of the first importance, and that the æsthetical and the beautiful should be considered as only secondary powers in the agricultural realm.

But neither should be separated from the other; for he who plants ornamental trees and shrubs, and arranges them tastefully about his home, will as surely enhance the value of his property as he would by increasing its productive capability. But in order to do this properly, some attention should be paid to the first principles of landscape gardening. The evergreens should flank the houses, and be planted in groups instead of the usual sentinel style.

Ornamental shrubbery should be arranged so as to create a pleasing sensation on the sensorium of even the most careless observer. Let flowers abound everywhere. Let engravings and paintings adorn the walls of your homes, and let music be encouraged as a special gift from God. Let the beautiful of the city be combined with the useful of the country. In fact, let no effort be spared to render the latter more attractive in every way than the former.

It is in this way only that the rapid decrease of our rural population can be prevented, production exceed consumption, and men and women ever be enabled to announce that paradise has been regained.

UNDERDRAINING.

Dr. L. D. Morse, Cor. Sec. State Board of Agriculture:

DEAR SIR: In accordance with your request, I herewith submit the following facts, in reference to underdraining, which are carefully compiled from various sources, mainly, however, from the writings of Hon. Henry F. French, a practical farmer, and one of unquestionable integrity.

The advantages of thorough draining may be briefly summed up as follows:

1ST. IT DEEPENS THE SOIL.

A deep soil is better than a shallow one, because it furnishes a more extensive feeding ground for roots, as many of the elements necessary for the growth of the plants may be one or two feet beneath the surface. Indian corn in dry soil sends down its roots two feet or more; so do most of the grasses.

2D. THOROUGH DRAINING PROMOTES THE PULVERIZATION OF THE SOIL.

The first effect of underdraining is to dry the surface soil, allowing the surplus water to pass out of it into the drains, so that in early spring it may be worked with the plow as advantageously as undrained land in mid-summer.

3D. THOROUGH DRAINING PREVENTS SURFACE WASHING.

Where land is properly underdrained, the rain as it falls is at once absorbed and passes downward into the drains, carrying with it to the roots of the plants all the soluble manurial substances which lie on, or near, the surface. So great is the absorbent power of drained lands, that after a protracted drouth all the water of a heavy rain storm will be absorbed by the soil, so that for a day or two none will find its way to the drain, nor will it run upon the surface.

4TH. IT LENGTHENS THE SEASON FOR LABOR AND VEGETATION.

Nearly two weeks may be gained in spring planting by thorough draining. The ground becomes almost as dry in two or three days after the frost comes out in the spring, or after a heavy rain, as it would in as many weeks were the ground undrained. Corn has often been planted on well drained fields, while on adjoining ones teams could not travel without miring down. Ten days gained by early planting often secures a crop of corn or cane from frost in the fall. In less than that time a whole field of corn passes from the milky stage, when a slight frost would ruin it.

5TH. IT PREVENTS FREEZING OUT.

Usually the soil is pulverized only to the depth of six or eight inches. Below this is a stratum of clay nearly impervious to water. The autumn rains saturate the surface soil which absorbes water like a sponge. When, if suddenly frozen, the water crystalizes into ice, and the soil is thrown up into spicules or honey combs, and the poor clover roots or wheat plants are lifted out, and by a few repetitions of this process, they are left dead on the field in the spring. Whereas on well drained land, plants are not thus "heaved out," but retain their natural position, and awaken in the spring refreshed by their winter's repose.

6TH. IT PREVENTS THE EVIL EFFECTS OF DROUTH.

All soils, in order to resist drouth, should be well disintegrated and loosened up, so that their capacity to receive and retain moisture, will be increased. The plants in a dry time send their roots down into the subsoil to obtain the moisture thus stored up for their time of need. The drier the soil in the spring the deeper the roots will penetrate it, and thus enable the crop to withstand the effects of a summer drouth. During the great drouth of 1860 the fact was fully substantiated that the crops on lands that were drained were far better than those, in the same locality, that were undrained. In one instance, during the drouth alluded to, a crop of beans was grown on a piece of well underdrained land without as much rain falling, during the time the crop was growing, as would fall in a shower of fifteen minutes' duration, while vegetation on an undrained field adjoining it was utterly ruined for lack of moisture.

7TH. IT WARMS THE SOIL.

Draining increases the warmth of the soil during the spring and fall months, often as much as 15 degrees. Indian corn vegetates at about 55 degrees, while at 45 degrees the seed would rot in the ground. The soil is rendered colder by evaporation. If land is not naturally or artificially underdrained, all the water on the surface must escape (if at all) by evaporation. The principle of evaporation may be illustrated by washing the hands on a cold day, and exposing them a few moments to the air. The same principle of evaporation which thus affects the hands renders the land cold when saturated with water, every gallon of which, thus carried off by evaporation, causes a loss of heat, equivalent to raising 5½ *gallons of water from the freezing to the boiling point*,

There are certain plants, as well as animals, which are aquatic in their character, and cannot long sustain life out of it. Others require a certain quantity of water, but whose chief dependence is upon the atmosphere. To the latter class belong the plants grown upon the farm. Some lands are naturally underdrained, while others are composed of clays of such a compact character that it is underdrained. No air can penetrate it, and seeds planted therein must rot before germination takes place, unless the planting is deferred until the excess of water can pass off by the slow process of evaporation. Immediately after the fall of considerable rain upon a field that is underdrained the water passes into, and through the drains, leaving the ground light and porous. Whereas if flooded and saturated with water it becomes sodden and compact, and when plowed in the spring, it remains in clods which soon become as hard as bricks, and in condition favorable to a healthy growth of plants.

Aside from all this, it has been definitely ascertained that draining makes 33⅓ per cent. difference in the amount of labor which a team can perform on a farm in a given time, that is to say, two horses will do as much plowing on a drained farm as three would on an undrained one, their strength is correspondingly less taxed.

The best machine for manufacturing tile is the "*Hotchkiss and Buss'*" patent, which is manufactured by the "Miami Machine Works," at Cincinnati, Ohio. It is said to make tile ⅓ faster and with ⅓ less power than any machine now in use. We hail the advent of this machine with much pleasure, and predict that tile will be made in such quantities, and at such low rates, that underdraining will become general wherever it is needed.

Of the several kind of tiles, the round or pipe tile is the best. No tile are burnt without warping or shrinking. The ends should be well fitted together. Pipe or round tile can be turned over to make fils one with another, and still be right side up. The objections to the horse shoe tiles are, 1st. The edges being sharp they will sink into the ground; 2d. They are liable to split lengthwise through the back; 3d. The stream of water spreading over a flat surface cannot run so rapidly, nor remove obstructions so readily as where the current is concentrated to one point in the bottom. In former times a foot or more of small stones were placed over the tiles, a foolish and expen sive process, for there is no trouble in getting the water into the tile. Parks, the great English Drainer, states that only 1.500 of the water gets through the pores of the tile, the balance being admitted through the joints. English drainers make their drains a foot wide at the top, and four inches at the bottom, and with an appropriate tool scoop out and form a depression of half the size of the tile in which the latter are placed. The soil is then thrown in upon them without further trouble or anxiety as to the result. Ditches are the most readily filled with a flow using a double-tree long enough to reach across the ditch, a horse walking on each side. At 33 feet apart, the usual distance, except in unusually stiff clay lands, 1,320 pipes will lay an acre, reckoning a foot to each pipe. Drains well laid last more than 50 years. Water enters the drain at the bottom, not at the top; for the same reason that if you pour water into a cask of sand with holes made in the sides, at several heights, the lower one will discharge first, and the top one last. The capacity of pipe tile is in proportion to the square of their diameters; thus if an inch tile will carry one inch of water, a 2 inch tile will carry 4 inches, and a 3 inch pipe 9 inches, and so on. A two inch pipe is the smallest that should be used for general purposes.

Lateral or side drains should be jointed to the *main* ones, pointing *down* stream and enter the main drain near the top.

If possible there should be one inch of fall to the rod, or 3 inches to 100 feet, with large tile, is admissable.

"Drainage is a subject upon which much has been written, and in the multiplicity of ideas advanced, there have been many at variance with the results of after experience. Fortunately, at the present time, the mistakes of those who have preceded us have been discovered and corrected. There is but little occasion now to go wrong in the matter. As to its profitableness, the farmers who have constructed the greatest extent of drainage are those who are most enthusiastic on the subject. In general terms it may be said that the increase of crops will, in two seasons, pay the expense of the work, The crops being increased if the work is permanently executed, the value of the land is also greatly enhanced. Loudon, who is good authority, says: "Whatever may be the expense and trouble incurred in draining, it may be safely asserted that if the work is judiciously contrived and properly executed, no kind of outlay will prove so beneficial to the cultivator.

A great change in public opinion has been experienced in the last few years. When John Johnston, of Fayette, Seneca county, New York, who was the pioneer of drainage in this country, first put down tile drains on his farm, he was jeeringly asked whether he was going to "put down crockery all over his farm;" but the increase from 7 to 28 bushels of wheat, as a return per acre, was the best answer to his less enterprising neighbors. As to the universality of its adoption, Mr. Johnston says he never saw 100 acres in any one farm, but a portion of it would pay for draining. In the ten years previous to 1856, England invested £16,000,000 (eighty million dollars), by private enterprise in drainage, and in that year the government granted a secured public loan of £4,000,000 (twenty million dollars), in aid of similar works. It must be remembered, to appreciate the extent of its application, that England is a small country, not so large in extent as many of our States. In conclusion we feel assured that farmers whose avocation is so dependent upon the weather, will, by adopting the plan above indicated, place themselves above the contingencies which most affect their chances of success."

Very respectfully, WM. M. KING.

FARMERS' HOMES.

As surely as "a man is known by the company he keeps," so surely is the character of a rural population judged by the appearances of their homes. A thrifty, intelligent people will have neat, appropriate, attractive homes. Nomadic tribes dwell in tents.

The early pioneers were obliged to build houses of logs, to split and hew the timber for floors, to build chimneys of stones and sticks. Everything about the building, even to the doors and hinges, was the work of their own hands. Yet, even here, in these humble dwellings, a difference of taste and skill was plainly visible. Some, who had little energy and less taste, who begrudged every hour spent on a house, would put up a rude pen, shingle it with split boards, hang up blanket for a door, and the home was finished; cold, solitary and comfortless it stands alone, hardly a shelter fit for a horse or a cow. On the contrary, a man who has the elements of thrift within him will not be content with merely sheltering his family, but will build his cabin with a due regard to comfort, and with an awake eye to its appearance; he will see that the logs are duly squared, the corners perpendicular, the roof carried up even and true, projecting sufficiently over the eaves to give an air of protection to the building. The grounds adjoining will be kept free of all useless rubbish. In short, an air of comfort and tidiness, which costs nothing, will be thrown around his home, proclaiming that there is the abode of industry, thrift and happiness.

Without subscribing to all that Downing says of the connection between lynch law and log huts, his reasons why farmers should have good and pleasant homes, are so forcible and true that we cannot forbear indulging in a rather long quotation.

"There are three reasons why my countrymen should have good houses.

The first is, because a good house (and by this I mean a fitting, tasteful and significant dwelling) is a powerful means of civilization. A nation whose rural population is content to live in mean huts and miserable hovels, is certain to be behind its neighbors in education, the arts, and all that makes up the external signs of progress. With the perception of proportion, symmetry, order and beauty, awakens the desire for possession, and with them comes that refinement of manners which distinguishes a civilized from a coarse and brutal people. So long as men are forced to dwell in log huts and follow a hunter's life, we must not be surprised at lynch law and the use of the Bowie knife. But when smiling lawns and tasteful cottages begin to embellish a country, we know that order and culture are established. And as the first incentive towards this change is awakened in the minds of most men by the perception of beauty and superiority in external objects, it must follow that the interest manifested in the Rural Architecture of a country like this, has much to do with the progress of its civilization.

The second is, because the individual home has a great social value for a people. Whatever new systems may be needed for the regeneration of an old and enfeebled nation, we are persuaded that in America not only is the distinct family the best social form, but those elementary forces which give rise to the highest genius and the finest character, may, for the most part, be traced back to the farm house and the rural cottage. It is the solitude and freedom of the family home in the country which constantly preserves the purity of the nation and invigorates its intellectual powers. The battle of life, carried on in cities, gives a sharper edge to the weapon of character, but its temper is, for the most part, fixed amid those communings with Nature and the family, where individuality takes its most matured and strongest development.

The third reason is, because there is a moral influence in a country home—when among an educated, truthful and refined people, it is an echo of their character—which is more powerful than any mere oral teachings of virtue or morality. That family whose religion lies away from its threshold, will show but slender results from the best teachings, compared with another where the family hearth is made a central point of the Beautiful and the Good. And much of that feverish unrest and want of balance between the desire and the fulfillment of life, is calmed and adjusted by the pursuit of tastes which result in making a little world of the family home, where truthfulness, beauty and order have the largest dominion.

The mere sentiment of home, with its thousand associations, has, like a strong anchor, saved many a man from shipwreck in the storms of life. How much the moral influence of that sentiment may be increased by making the home all that it should be, and how much an attachment is strengthened by every external sign of beauty that awakens tone in the young, are so well understood that they need not be demonstrated here. All to which the heart can attach itself youth, and the memory linger fondly over in riper years, contributes largely to our stock of happiness, and to the elevation of the moral character. For this reason, the condition of the family home—in this country where every man may have a home—should be raised till it shall symbolize the best character and pursuits, and the dearest affections and enjoyments of social life."

But the settlers of the forest and prairie may with some reason say, this is all very well for old countries, where all the facilities for building, materials, and workmen, are abundant; but for us who are obliged to combine all the trades in ourselves, with hardly more than an axe and saw, for tools, what is the use of talking to us, in our log cabins of taste and rural architecture? True, but do not some men build handsomer cabins than others? Is it always the richest man who has the best house? Can you not think of some one of your neighbors, who, without expending any more money, has contrived to make his home more tasteful, more tidy—and the surroundings neater, given them a more comfortable appearance, than the rest of you have done? Is'nt it a pleasure to visit that man and enjoy the hospitality of his home? Even if the floor is made of puncheons, they are well hewn and smooth, the joints are close and even, the logs are smoothly trimmed, the crevices are well "chinked and daubed," everything is in order, the door swings clear, the latch catches well, the string a good substantial one, "always hangs out." Nor is this air of thrift and tidiness confined to the dwelling; the outhouses, barns, stables, etc., are neatly built, (not expensively) the yards are kept in order, the fences are in good repair, nothing appears to be left for to-morrow, or for some one else to do.

Such men are an acquisition to a neighborhood, they stir up others to imitation, awaken the energies and create a desire for better things. Sometimes it is said that these "thrifty men" are no better in other respects, no more kind-hearted, no more willing to lend a hand to aid the stricken poor, than the man who puts up a pen and calls it a house, hangs his harness in the only room, lays a stone on the blanket which serves for a door, to keep it from blowing aside and letting in the storm, whose plows and harrows, wagons and carts are bestrewn about the front yard, and pigs and cows stand guard over the door. A kind heart may bear all this and more, but life and energy are sadly wanting; and, though the man may think he is kind, yet, if he could feel the discomfort of those who make up the family, he would hardly fail to take to himself the imprecation pronounced upon him who "provideth not for his own household."

The story that is told of an old negro, who, when asked, during a pouring rain, why he did not repair his roof, replied that it rained and he could'nt—yet why don't you do it when it does'nt rain? Oh! it don't need any fixing then; sets forth the character of too many of our farmers, especially in the new counties. Delay, dilatoriness, putting off till a more "convenient season," want of material, a thousand like causes for this state of things, may all be summoned up in one word—indifference. They grew up under such circumstances, and survived, and they think that their children can do the same. They do not stop to consider if their sons would not be stronger, more intelligent, better farmers; their daughters handsomer, more attractive, make better wives, could they grow up amid the surroundings of a home where energy and taste had directed the labor.

Let a man once make up his mind that he will have his home neat and tidy, and it is done. It only requires resolution, and hindrances disappear like "the visions of night." The magic of will is all that is required.

We have thus far kept in view only the pioneer and his primitive cabin, and if taste can render romantic ideas of "love in a cottage" a lovely reality, what shall we say of those who, living in more prosperous days, do not improve according to their opportunities.

When society has so far progressed that the new house, with glazed windows and painted doors, takes the place of the original cabin, may not all the little details which comfort demands keep pace with outside appearances. The strong, vigorous man, who spends his days in the field and barn, and his evenings leisure by the warm and pleasant fire, too often neglects those little conveniences about his house which go so far towards lightening the labor of the companion of his toils and pleasures. Sometimes a few dollars would bring the water of the well or cistern directly to the door, if not into the kitchen itself, yet the sum which thus expended would save many a weary tramp through mud and snow to the distant spring cannot be afforded, though willingly spent upon some implement which will lighten the labor of the farm. Frequently this inattention to conveniences about the house is the result of obtuseness, the man does not see their necessity, he has been accustomed to this condition of things, and does not stop to think, and the wife, good woman, is used to it and toils on uncomplainingly, so the family suffers because the parents have not imagined that they could do better.

But there comes a time in the life of every man, who has any ambition, when a new house is determined upon. Then display is almost sure to be the first idea; it is not how pleasant, convenient and economical a home shall we build, but how fine shall it be, how shall we outshine our neighbors.

We remember a case of this kind. In our boyhood days away off among the Green Mountains of Vermont, a large majority of the farmers had acquired a fair competency, and some had become wealthy. Among these latter there arose "once upon a time" a mania for building. The splendid brick house of farmer A. was outshone by the stone palace of farmer B. The costly carpets and elegant parlor furniture of Mrs. C. could not compare with those of Madam D. And so the strife went on till hardly any country district could show more *costly* houses. But about the time these splendid edifices were finished it was found that they were far too fine to *live* in and a few rooms were fitted up in the wood house or some other corner where the family stayed, while the "folly" was locked up, only to be used for company on grand occasions.

Now, after all this expenditure of money, were these people any more comfortably settled, or happy in their magnificent mansions, than they were in the "old house?" Not a bit. Their pride was flattered, but that was all.

The first question which the farmer who proposes to build, should ask himself, is, what do I want to build for? What sort of a house do I need? Shall I build a splendid mansion, or only a convenient and cheerful home? Shall I build for others to look at, or for myself to enjoy? If he believes that a convenient, pleasant, and tasteful home is what he wants, then let him set about it with an eye to the useful as well as the beautiful. Be careful about planning too large a house, never larger than the requirements of the family absolutely demand. More houses are built too large than too small.—If after a few year's use, it be found that the original design was too small, and there be "funds in the treasury," it is easier to add a room or a story, than to keep in repair a house whose first plan exhausted the sum originally designed for its erection. Washington Irving wrote a very true satire upon a "shingle palace,"—one of those houses where the plan was so much greater than the means, that it was never carried out and the house stood with its half glazed windows and unpainted walls, a monument of pride and folly.

Sometimes the family changes, the sons and daughters grow up and leave the parental roof; then a large house becomes a burden, and to keep it up in its original style, is a tax upon the purse and energies of its owners. We say again to farmers, do not build too large, for study economy as you will, your house will cost you more, vastly more than you expect, and nothing looks meaner than a half-finished house.

Having determined upon the size and cost of your house, select the ground with an eye to your own and family's comfort. Because it will show well, do not put it on the top of some inaccessible hill, away from any shelter either in summer or winter. If there is a natural grove in a desirable situation, do not cut it down in order to plant a few saplings, which will arrive at maturity about the time you are old enough to die. Select a spot which has pleasant surroundings, where all the details of farm buildings can be carried out. I do not mean that the barn should encroach upon the parlor windows or the front door open upon the cattle yards. But there is a fitness of things in having all the farm buildings constitute a part of the home surroundings, so as to form one harmonious whole. A farmer who does not enjoy a visit to his well kept and comfortable barn, has no business on a farm.

Choosing a site is sometimes a difficult matter, especially if the land is in forest, because so much depends upon how the landscape is treated, and to a beginner it is difficult to tell what will be the effect of certain improvements. Above all things secure a good drainage, nothing can be made of a place where this is not attended to. The cellar should be so thoroughly drained, that it will be at all times dry. A very good way to do this, especially where the foundation is upon hard clay, is, to sink a ditch one or two feet below the bottom of the cellar and fill it up with a substantial dry wall. It may be well, if there is ever likely to be much water, to leave a small channel in this wall. Let there be a drain to this ditch from the lowest part, which will carry off all surplus water, and never allow the bottom of the cellar to become even damp.

As to what the exact plan of the house should be, it is impossible to give any directions which will suit all. Downing remarks that domestic life varies so much, not only in different States, but in different parts of the same State, that what will suit one class of farmers would not be at all appropriate for another, therefore, every man must decide for himself the general character of the dwelling which will suit not only his taste and desires, but the state of his finances. While no man should undertake to build any considerable house without the advice and assistance of an experienced architect, yet it will not do to trust all to him, and take it for granted that he will turn you out exactly such a house as you want, for many of these artists forget that a house should be made to live in as well as to look at. A house may make a beautiful picture on paper, yet want all the essentials of a home. It is sometimes said of a convenient and tasteful house that it was built to live in and not to rent. That is, it is not expected that a house which is built merely to bring its owner so much money per month, should contain all the conveniences that one which is intended for the owner's home may be provided with. No matter how well digested a plan may be, there will always be found some changes to be made during the process of construction.

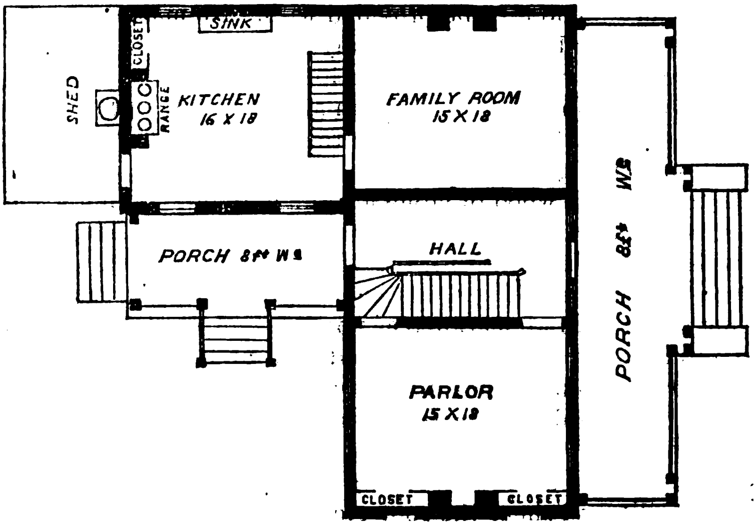
Always bear in mind that though symmetry and proportion contribute to the beautiful in architecture, the useful affords the highest satisfaction to the great majority of mankind.

As to material, wood or stone are the only ones which good taste admits for country houses. Brick smacks of the city. Its staring red surface is not in harmony with the surrounding landscape. If economy requires its use, the walls should be so varied as to give the building as rural an appearance as possible. A country house in our warm climate requires to be spread out and well supplied with porches and verandahs, they not only give a rustic air to the house, but afford that ample shade so indispensable to all dwellings in a southern climate. Let there be also that great element of beauty in any country house, a wide spreading roof. Take the most beautiful cottage or villa and shear the roof close to the walls and its beauty is spoiled. On the contrary, a skillful architect by adding a cornice here, and a verandah there, will so completely change the appearance of even a "shingle palace," that it will seem to have undergone some magical transformation.

While we are trying to write for farmers of moderate means, and know that with many of them cost is everything, we cannot help endeavoring to elevate their ideas to something better than the straight up and down rectangular, close shaven structures which so often disgrace the landscape. In arranging the interior of the "home," the wife should have almost *carte blanche*. It is her province; there is her sphere; her comfort and convenience are paramount considerations.

While the farmer spends his time among his fields and barns, she reigns within doors, and there all should be made as much to her taste as possible. A woman who, as most farmers' wives must do, gives a large portion of her time and labor to the duties of housekeeping, ought to know better than any man can what the arrangement of the inside of the house should be, to enable her to accomplish her daily rounds of duties with the least trouble and confusion. A smoking chimney and a scolding woman are usually quoted as illustrations of the deepest misery in a household; but the second depends upon the first, for if the chimney did not smoke, would the wife scold? of course not. And if a man builds, or allows to be built for him, a smoky chimney, and provides green wood, and frequently not enough of that, he deserves to be scolded. Thus it is clearly demonstrated that the man is blamable for the greater part of the infelicities which occur in the house.

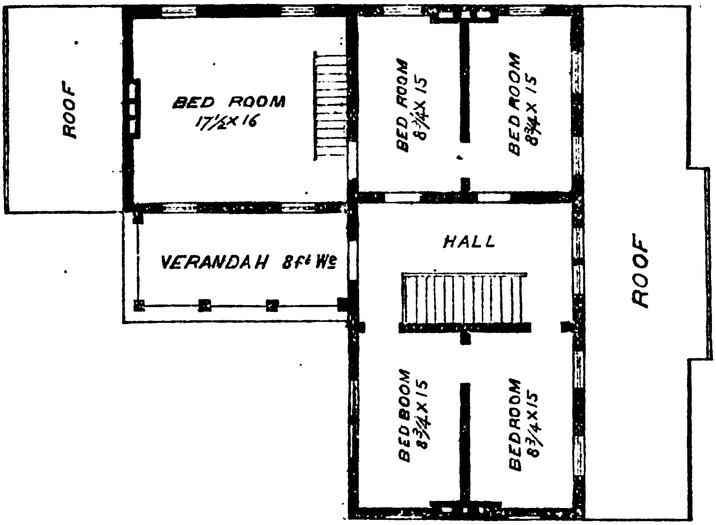
We might, with propriety, proceed to urge the necessity of building woodhouses and other convenient outhouses, but a man who has



GROUND FLOOR.

the good sense to build himself a home, dictated by good taste, and a desire to render his family happy and comfortable, will not fail to provide the necessary appendages to a farm house.

Finally, we would urge upon all who propose to build, to watch carefully over the expense, and curtail as much as possible the extravagance of your architect's design; be sure that you will have enough money left, after the house is finished, to spare liberally for the details of furnishing, which contribute to make home cheerful and happy.



CHAMBER FLOOR.

DESCRIPTION OF DESIGN.

[For perspective view, see frontispiece.]

The foregoing design, by the late Wm. Rumbold, Esq., county architect for St. Louis county, and designer of many fine buildings in the city, embodies many points of a cheap and substantial farm house. It may be built of almost any material. If of wood, vertical siding and battens may be used, or the common clapboards. If of brick, it would be well to take the dimensions given, as the size of the interior, with a little allowance, so that the rooms may be fully as large as represented. But as has been said before, a brick house in the country is out of place, even if painted, it will look shabby in a few years.

A hall opening entirely through the house insures good ventilation in summer. The front and rear porches are very pleasant places to sit and read the agricultural papers, or plan the operations of the farm. The kitchen is protected by a wide porch from the direct rays of the morning sun. In the plan there is no provision made for an outside cellar door, but this may be made on either side of the house, as from the nature of the ground it may be found most convenient. A cellar under the whole is almost indispensable for a farm house. Many object to using a cellar for storing vegetables on account of the bad smell proceeding from them during decay. But if not used for this purpose, it will still be found worth its cost in the superior dryness and healthfulness it gives to the whole house. There are certain vegetables, as cabbages, turnips, etc., which do not keep well in a cellar, and are better stored in heaps out of doors; but this is no reason why the cellar may not be useful for storing many things which cannot well be kept elsewhere. Be sure and provide a good cellar, and you will never regret it.

The plan contemplates a lean-to shed in the rear of the kitchen, provided with a large kettle set in brick work, to be used for heating water on washing days, making soap, and for a variety of purposes incidental to the farm. This shed will be found extremely convenient, but it would be better to have a longer building containing a good sized room, also well fitted up with appliances for facilitating the labors of the kitchen. A furnace for heating flat-irons may be made by placing a thick piece of cast iron over a small furnace built in the brick work, and connected with the same flue as the kettle. Such furnaces are very useful, especially in summer, because they prevent the room from becoming so extremely warm, as it does where stoves alone are used.

Beyond this room may be the coal and woodhouse. Above them will be a good garret, where may be stored all kinds of fruit till cold weather requires them to be removed to the cellar. A pump should be attached to the sink, and a waste pipe connect with the main sewer. A general sewer is almost as necessary for a house in the country as in town. People in the country are apt to be very inattentive to the matter of providing sewers to carry off the slops from the kitchen and wash-house. A pond before the door often salutes the nose as well as the eyes, and it is only because it is in the country that its offensiveness is not felt, and only that the pure breezes of heaven have free sweep, or it would breed a pestilence. Side drains may connect with the main one, especially the overflow pipes from the cisterns, and by this means water enough be conducted through to keep it clear. In the country, where stoneware pipe cannot be procured, these drains may be made of oak plank, and will last a long time.

The plan does not show any closets in the second story, but they can be easily built, and should be in every room. The garret stairs are, of course, over the first flight.

Porches are costly and require a good deal of care to keep them in repair, but they are very pleasant. By making the windows of the family room come to the floor and open on to the porch extending the whole length of the room it would much improve it.

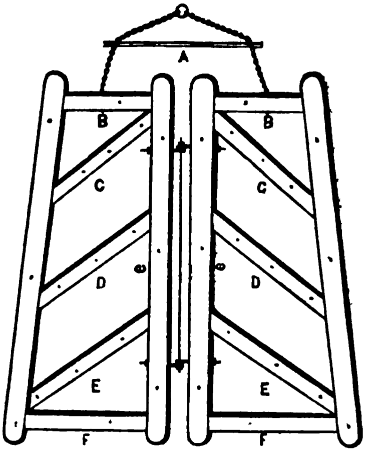
We throw out these hints to those who have the means to reduce them to practice, just so with regard to fire and water. A furnace which will warm the whole house, may be placed in the cellar for about the same price as grates and marble mantels, and thus the dust and smoke incident to grates and fire-places be avoided. There is much prejudice against furnaces, but having tried one for six years, we are satisfied that the hot air furnace is the best method of warming dwellings. The trouble about them usually arises from not having a good draft, or being too small. If the size is not sufficient, they must be kept red hot to afford heat enough, then of course, the air is deprived of part of its oxygen and becomes unfit to breathe. If large, it is seldom necessary to make them red hot, and the fresh air constantly circulating around them fills the room with an atmosphere which is continually renewed and can never become foul.

By building a tank in the garret, water may be conveyed to all parts of the house without the trouble of pumping. This saves about the labor of one servant, besides it is a great comfort to have the wash pitcher always full.

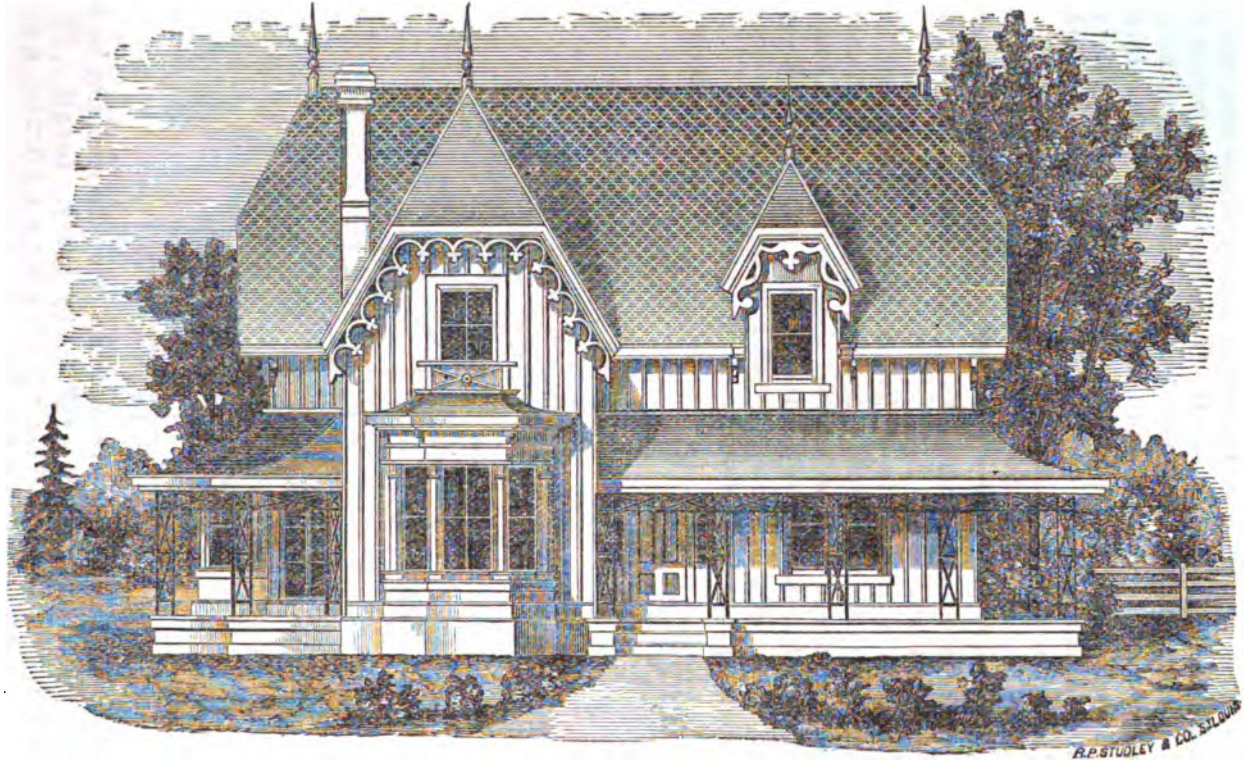
A great many more little comforts may be added to a small house which will render it a thousand times more pleasant and satisfactory, than a magnificent mansion without them. If it is objected that farmers cannot afford to have all these things, then we would say do without, cheerfully, till you can, but remember, that few luxuries yield half the pleasure to be derived from a pleasant house.

SPENCER SMITH.

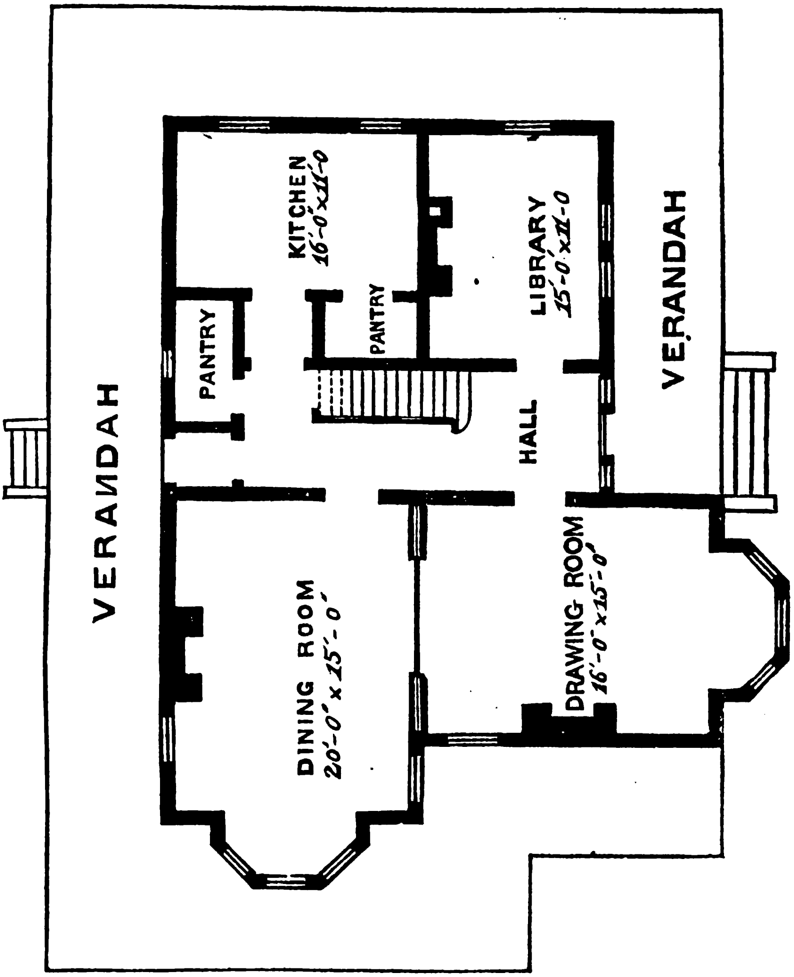
A PENNSYLVANIA HARROW.



The proportions or measurements are, viz: the stuff may be 4 by 3 inches—but 3 inches square is sufficiently heavy. Length A, 2 ft. 4⅛ in.; B, B, 1 ft. 3 in.; C, C, 1 ft. 11 in.; D, D, 2 ft. ½ in.; E, E, 2 ft. 2 in.; F, F, 1 ft. 9 in.; G, G, 5 ft. 6 in. The teeth should be of steel, and scant ¾ square. The coupling should be so arranged as to allow widening the beams for harrowing corn, or closing them for ordinary purposes.


R.P. STUDLEY & CO. ST. LOUIS

CHEAP COUNTRY HOUSE.


VERANDAH
PANTRY
KITCHEN
16'-0"x11-0
PANTRY
LIBRARY
15'-0"x11-0
VERANDAH
HALL
DINING ROOM
20'-0" x 15'-0"
DRAWING ROOM
16'-0"x15'-0"

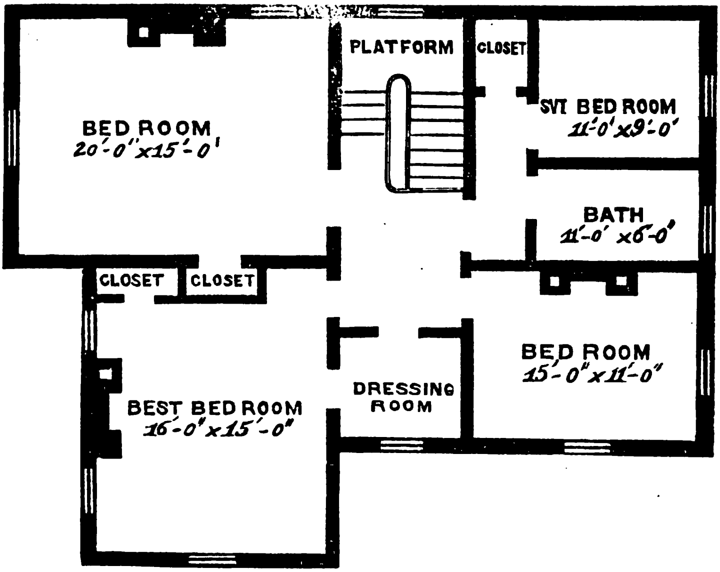
GROUND PLAN.

CHEAP COUNTRY HOUSE.

The neat country house here presented, was designed by a Canadian architect, and is copied from the *Canada Farmer.* It is adapted for a dwelling of rather moderate cost, and well suited for a village or suburban residence, or even for a farm house. It lacks a wood house, but this might be added to the rear, or built at a short distance from the main building. The following is what the *Canada Farmer* says of it:

"It is very important in this country to secure in connection with a dwelling house plenty of verandah room, and large and airy apartments capable of easy and complete ventilation. During the recent sultry weather, every one who had an outside porch or verandah was certain to be occupying it in his hours of rest and leisure, and those who had not this luxury were disposed to envy their more fortunate neighbors, or at all events would mentally resolve that if ever they built a house they would have a verandah. These appendages, besides being ornamental and giving relief to plain walls, are pleasant as an out-door retreat in hot weather, serve to keep the interior cool, and will be found very convenient also in wet seasons, especially where there are children.

As the accompanying design was prepared for a country house, all these convenient arrangements have received particular attention, at the same time that economy in construction has been kept in view.



CHAMBER FLOOR.

By referring to the drawings it will be seen that the house is entirely surrounded by a wide and airy verandah, the roof of which is supported by light lattice posts.

The dining-room projects from the main wall, and is furnished with a bay window, where views can be had to the south, east, and west. The drawing-room, which connects with the dining-room by sliding doors, also projects, and is furnished with a bay window similar to that in the dining-room, looking north, south, and west. These rooms are each sixteen feet wide, and eighteen feet long, and furnished with fire places. To the right of these rooms is a spacious hall, nine feet wide, running right through the house from back to front; in which are placed stairs leading to the upper rooms. Opposite the drawing-room is the library, also furnished with a fire-place. In the rear of the stairs, and opposite the dining-room, is the kitchen, connecting with the main hall by a short passage; and on each side of this is a pantry, one opening out of the kitchen, and one off the main hall. On the first floor—the chamber floor—there are five bedrooms, and a dressing-room connecting with the best bed-room, and three wardrobes. The three principal bed-rooms are provided with fire-places. Although the upper story is termed a half one, the bedroom ceilings are ten feet high, and only a small part of the slope appears in the rooms.

The exterior will have a very pretty appearance, broken up as it is with projections, bay windows, verandah, and steep-pitched roof, etc. By lovers of the picturesque a house of the above description, situated on a fine smooth lawn, and surrounded with groups of shrubs and trees, would be thought the height of comfort and elegance. Such a house, though commodious and ornamental, need not be an expensive one. If properly built with timber, and placed on a brick or stone foundation, it would last for many years, and if due regard were paid to the selection of seasoned lumber, and properly plastering the walls down to floors, a warm and durable house would be the result.

It will be seen, by referring to the elevation, that it is the intention to build this house of timber, and framed in the usual manner, the sills of the frame resting on brick or stone foundations, whichever may be most conveniently procured in the locality. The outside will be sheeted with one and a quarter tongued and grooved and upright boards, and the joints covered with inch by three inch batten. The interior can be finished to suit the tastes of those who may build.

THE ILLINOIS INDUSTRIAL UNIVERSITY LECTURES.

The Board of Trustees of the Illinois Industrial University adopted measures in December last for inaugurating an annual course of Agricultural Lectures and Discussions, to be held at the University located at Champaign. In addition to the Professors connected with the institution, lecturers were selected from various parts of the State, and several from other States, four being selected from Missouri. A circular was prepared, giving the plan, terms and programme of the lectures. This, in addition to being mailed to a great number of individuals, was inserted in full as an advertisement for three weeks in the agricultural papers of Illinois and Missouri. Deeming it of value as a matter of record and for future reference, the circular is here given, as follows:

AGRICULTURAL LECTURES AND DISCUSSIONS.

Office Corresponding Secretary Board of Trustees
Illinois Industrial University,
Champaign, December 19, 1868.

The first annual course of Agricultural Lectures and Discussions, instituted by the Illinois Industrial University, will be held at the University, in Champaign, commencing Tuesday, January 12, 1869, and continuing during four days of that and the subsequent week, with three sessions in each day. This is intended to be an annual gathering of the farmers of the State, and of their sons and daughters, for the purpose of discussing the best methods of agriculture; and it is earnestly hoped that all who desire to improve our tillage, our crops, and our live stock, will be present and lend a helping hand. No charge is made for admission. The University provides a hall, properly warmed and lighted, and pays the expenses of the gentlemen who have kindly consented to open the discussions. Each lecture, essay or "talk" will be followed by a discussion on the same subject, in which all are invited to participate. Dr. John A. Warder, author of "American Pomology," will lecture daily from 4 to 5 P. M., on the subject of "Fruit Culture." Good boarding places can be had convenient, and at reasonable rates. Railroads will be solicited to return persons in attendance at reduced rates.

J. M. GREGORY, *President.*

W. C. FLAGG, *Corresponding Secretary.*

PROGRAMME.

Tuesday, January 12.—Morning, 9 o'clock, Introductory Address, "Agricultural Facts and Theories," Dr. J. M. Gregory. Afternoon, 2 o'clock, "The Natural Sciences and Agriculture," Professor W. F. Bliss. Evening, 7 o'clock, "Relation of Chemistry to Agriculture," Professor A. P. S. Stuart.

Wednesday, January 13.—Morning, 9, o'clock, "Meteorology," Prof. W. M. Baker. Afternoon, 2 o'clock, "The Soils of Illinois," H. C. Freeman, of the State Geological Survey. Evening, 7 o'clock, "Management of Soils," Dr. John A. Warder.

Thursday, January 14.—Morning, 9 o'clock, "Grass, Dr. L. D. Morse, editor *Journal of Agriculture.* Afternoon, 2 o'clock, "Corn," M. L. Dunlap, agricultural correspondent *Chicago Tribune.* Evening, 7 o'clock, "Wheat," W. C. Flagg.

FRIDAY, JANUARY 15.—Morning, 9 o'clock, "Potatoes," Jonathan Periam, Superintendent Practical Agriculture. Afternoon, 2 o'clock, "Root Crops," Jonathan Periam. Evening, 7 o'clock, "Agricultural Book Keeping," Captain Ed. Snyder, Instructor in Book Keeping.

TUESDAY, JANUARY 19.—Morning, 9 o'clock, "Orchard Fruits," Dr. E. S. Hull, of Alton. Afternoon, 2 o'clock, "Grapes," Hon. Geo. Husmann, of Hermann, Mo. Evening, 7 o'clock, "Small fruits," Samuel Edwards, of Lamoille.

WEDNESDAY, JANUARY 20.—Morning, 9 o'clock, "Breeds of Cattle," Sanford Howard, Secretary Michigan State Board of Agriculture. Afternoon, 2 o'clock, "Horses," Col. N. J. Colman, editor *Rural World*. Evening, 7 o'clock, "Swine," Hon. Elmer Baldwin.

THURSDAY, JANUARY 21.—Morning, 9 o'clock, "Sheep," A. M. Garland, President Illinois Sheep Growers' Association. Afternoon, 2 o'clock, "Agricultural Botany," Assistant Professor Thomas J. Burrill. Evening, 7 o'clock, "Vegetable Physiology and Economy," John H. Tice, Secretary Missouri Board of Agriculture.

FRIDAY, JANUARY 22.—Morning, 9 o'clock, "Rural Economy and Rural Life," Dr. J. M. Gregory, Afternoon, 2 o'clock, "Fences and Hedges," Dr. John A. Warder. Evening, 7 o'clock, "Timber Growing," O. B. Galusha.

Thus was inaugurated a new and probably important movement in Western agricultural education and improvement. Regarding it as an experiment, it may safely be recorded as resulting successfully. The lectures and discussions were attended by the students of the University, seventy or more in number, quite largely attended by the citizens of Champaign and vicinity, and there was a goodly number from various parts of the State. The lectures were, most of them, of an eminently practical character, and the discussions lively and interesting. The whole will be published in a volume, for distribution, probably.

Copies of several of the lectures have been obtained and are here inserted:

RELATION OF CHEMISTRY TO AGRICULTURE.

A lecture delivered by Prof. A. P. S. Stuart, of the Illinois Industrial University, January 12, 1868.

In attempting to trace the relation of chemistry to agriculture, it may be well to inquire, first, what chemistry is, and, secondly, what agriculture is. Briefly, then, chemistry is the science of the elements. It isolates them, and teaches us their properties, their mutual relations and affinities, the changes which they undergo under different conditions, and the new bodies formed, when two or more of them combine, by the action of chemical force. These elements and their compounds, which are infinite in number and in the variety of their forms and properties, their mutual relations, and the changes which they undergo by their reactions on each other in the inorganic and the organic kingdoms, constitute the field of chemistry.

Secondly, what is Agriculture? It may be looked at from two points of view. It may be considered either a science or an art, and both, as yet, in an imperfect state. As a science, it is concerned with the conditions and laws of vegetable growth; as an art, it is, or should be the practical application of the science in such a way as to obtain the most abundant harvests. In a broader sense, it includes also the raising of some, or of all kinds, of domestic animals, and in this respect chemistry sustains a most important relation to agriculture; but for our own purpose, we shall not consider this view, but confine ourselves to the relation of chemistry to agriculture as a means of raising the best crops.

We shall accomplish our object best. perhaps, by considering the conditions essential to the healthy development of plants, and in what respect chemistry is related to these conditions. And, first, we may inquire, do all plants require the same conditions for their healthy growth? A little reflection will teach us they do not. Tropical plants will not flourish so well in cold as in warm latitudes, nor will the same species of plants flourish equally well in all soils in the same latitude. Are we then called on to study the conditions peculiar to each individual species? If so, our field of inquiry widens at once into an immense expanse. For the purpose of the farmer, however, it will be sufficient to consider the conditions of those plants in the cultivation of which he is expending his labor and capital. In this State, for instance, Indian corn, the cereal grains and the various fruits and roots are the plants in which he is chiefly interested, and the conditions of whose growth he is especially called to study. We shall accomplish our object on this occasion if we confine our attention to a single species.

The question then recurs, what are the conditions most favorable to the healthy development of plants? For it is by an analysis of these conditions that we shall best gain a clear idea of the relation of chemistry to agriculture. A careful study will teach us that these conditions are of a twofold character. Plants are conditioned by the objects that surround them and furnish them their food, as soil, moisture and the atmosphere, and secondly, by the forces which act on these substances, as heat, light, electricity, chemical force, magnetism, capillary force, and probably other forces with which we are but imperfectly acquainted. In other words, we have to study the elements of which plants are made, and secondly, the forces which act on and build up these elements into organic structures. Moreover, all these conditions must exist at the same time, and in the proper degree, that plants may flourish. Soil must be present of the right kind and in the right quantity. The same is true of moisture and the atmosphere. The necessary forces too must act, and with the right degree of intensity. No single substance or single force would suffice to make a plant. Carbon or charcoal is an essential element in the structure of every plant, but carbon alone could never make a plant, whatever forces might act on it. The same is true of every other element. Heat is a physical agent indispensable te vegetable growth, but heat alone could never produce a plant. In fact all the elements required by plants, and all the forces necessary to weave those element into cellular tissue, and other organic compounds, must be present at the same time, constituting a kind of complex condition in which a nice adjustment of material and force, the web of the vegetable organism is woven. Nor is it difficult to see, that, of all the conditions within which plant-life is possible, and the range is very wide, certain conditions will be more favorable to its development than any other, and that under these a plant will attain its maximum growth, and mature the most and best seed.

But it must be observed that of these conditions, some the farmer can modify, others not, or only partially. Soils can be modified in quality by adding substances which they do not contain; in texture by loosening or stirring them by various mechanical means, and by allowing organic matter like stubble or green crops to decay in them. In thus modifying his soils lies the chief power of the farmer to increase his harvests. The quantity of moisture, also, is in a measure under his control. When present in excess it can often be removed by drainage, and when scanty it can sometimes be increased by irrigation, but long continued rains or drouths, causing wet and dry seasons, are for the most part beyond his control. It is not denied that climate can sometimes be modified by man, so that districts generally dry may receive rain sufficient for ordinary vegetation; but this even in cases where it is possible, involves agencies extending over a considerable period of time. The atmosphere too is a necessary agent in vegetable growth, but the proportion of its gases, with some slight exceptions, cannot easily be modified by man. The physical agents heat, light, electricity, magnetism and chemical affinity, play a very important part in plant life, and although they can be transmitted into each other so that a given quantity of heat can evolve an equivalent quantity of electricity, and this electricity a corresponding quantity of magnetic or of chemical force, and although these forces (if indeed they be more than a single force under different phases), may in their relation to vegetable growth lie much more in the power of man to modify than has been supposed, still that farmer would be sanguine, who, in the present state of knowledge, should think to exercise more than a limited control over these capricious agents.

Thus far we have stated only the general conditions of plant life, and how far the agriculturist can modify them. We come now to examine these conditions more closely, and to inquire how chemistry is related to them. As already stated, they are of a twofold character. They involve matter and force. First, then, the matter of plants. Our inquiries on this head are embraced in three question. First, of what are plants composed? Secondly, whence is it derived, and, thirdly, in what form is it taken up by plants? All of these questions are of a purely chemical nature, and it is here, therefore, that agriculture and chemistry occupy common ground, or rather agriculture employs chemistry to solve its problems. If agriculture asks of what plants are composed, chemistry answers by analyzing them, and showing that they are made up of certain so-called proximate constituents, as cellular tissue, or cellulose, starch, sugar, gum, pectine, resin and organic oils and acids; also gluten, albumen, caseine and organic bases, etc.; that some of these constituents like cellulose, are common to all plants, that others like the alkaloids, strychnine and brucine, are found only in a few plants, while others, like starch and sugar, etc., are found in many plants, but in variable quantities. If agriculture inquire further of what these constituents are composed, chemistry answers by resolving them into their elements and teaching us that, as a whole, they are composed mainly of fourteen of the sixty-three known elements, viz. oxygen, hydrogen, nitrogen, carbon, sulphur, silicon, chlorine, phosphorus, potassium, sodium, magnesium, calcium, iron and manganese; that some of the constituents, like cellulose, starch, sugar, etc., consist of only three elements, when pure, viz. oxygen, hydrogen and carbon; that others, like some of the vegetable alkaloids, consist of the same elements, with nitrogen superadded, that these three or four elements constitute the great mass of matter in plants, and that the other elements in plants are found there in relatively small quantities, and these even very variable in different species.

But, besides these fourteen elements, which can be detected in most plants with comparative ease, chemistry detects others which exist there in very minute quantity, so much so as to escape the ordinary means of observation. It is only recently that, by improved methods of analysis, the rare alkaline metals, Lithium, Calcium and Rubidium, have been discovered in the ashes of plants. In fact it is as easy now to find lithia in the ash of a cigar, as it was formerly to find potash in the ash of the grape, the sugar-cane, the beet or the cereals. Fluorine is another element, of which traces have been found in the ashes of certain plants, and it is suspected of being in most plants, although in so small quantity as to escape detection. Iodine and bromine are found in sea plants; possibly they exist also in other plants. The strong family resemblance of the elements, chlorine, bromine and iodine, and the circumstance that they are almost always associated in nature, and the fact that chlorine is usually found in plants, leads to the suspicion that possibly iodine, and perhaps bromine may be there, too, in extremely small quantity.

Small quantities, too, of lead, zinc and copper are said to have been found in the ashes of certain specimens of the beech, birch and fir; and tin, lead, zinc and cobalt in the ashes of the oak. The ashes of a certain violet are said to contain so much zinc that places where it grows are selected for opening mines of zinc. Alumnium is found in the lycopodium and, perhaps, some other plants.

Fourteen elements, then, exist in most plants in sufficient quantity to be easily found; three or four of these make up the great bulk of the plant, the carbon constituting, in wood dried at 150° centrifugal, about one-half the weight, the ashes from ½ to 1½ per cent., and the rest being oxygen, hydrogen and nitrogen, the first two in nearly the ratio to farm water, with usually a slight excess of hydrogen. The nitrogen averages about one per cent. In addition to these fourteen elements, we find one or more of fourteen others in a few plants in almost infinitesimal quantity, and the number will probably be increased hereafter.

The question arises whether all these elements are absolutely necessary to the growth of plants. Some, we know are. A plant could not exist without oxygen, hydrogen, nitrogen and carbon, any more than a building could exist without solid materials, like wood, bricks or stone, or the animal, without bones and muscles and the materials of which to make them. The same is true, to a considerable extent, of potash, soda, lime, and magnesia, and iron, and phosphorus. It was a question, some years ago, whether these inorganic constituents were necessary to the growth of plants, and prizes were offered by societies interested in the subject, for a satisfactory solution of the problem; and it is now a fact as well established as any in agricultural chemistry, that plants cannot thrive without them. They are a necessary part of the food of plants, and perform functions which make up an essential part of the life of plants.

But how is it with those elements which are found only in very small quantity? Is their presence necessary, or merely accidental? Have the plants absorbed them in some such way as a person sometimes takes harmless, or even poisonous substances, by mistake? It certainly is not safe to conclude that their influence in the processes of life is commensurate with the quantity in which they are found, because no fact is more certain than that very small quantities of substances are sometimes very beneficial, and sometimes very injurious, even fatal to the life of animals. Why may not the same be true of plants? The probability is that no substance, even in very small quantity, can enter the circulation of a plant without modifying, in some way, the processes of life, and imparting to it properties and impressing on it an individuality which it would not have without it. A substance naturally foreign to a system, and even poisonous to it, may, if taken in sufficiently small quantity, not only modify some function without becoming fatal, but create a necessity for its presence, so that life, even, would be endangered without it. The eating of arsenious acid is a case in point. A person may acquire the habit of taking daily a quantity of arsenic, which, at first, would have proved fatal; but when the habit is formed then it must be continued that is, the arsenic has either created a function, or so modified existing ones, as to make its presence necessary. And something similar is doubtless true of plants. Different soils contain small quantities of different substances, which, absorbed by plants, may prove beneficial or injurious to their development, and may have their influence, among other causes, in producing those peculiarities so noticeable in the same species of plants. Why is it that clover, manured with gypsum, is so different from that manured with something else, in the size of its stems, leaves and flowers, as almost to be considered a different species?

But let us return to the elements, each one of them has certain properties, which are peculiar to it and which distinguish it from every other element and these properties vary either in kind or degree with every change of condition to which the element is subjected. Four of them, oxygen, hydrogen, nitrogen and chlorine, are gases at ordinary temperatures, and the first three have resisted all efforts to condense them to liquids. They are, in the free state, permanent gases. Fluorine should probably be added to the number, although so little is known of it in the free state, that little can be said of it. The rest, with the exception of bromine, which is a liquid, are solids. In their affinities, or their tendency to combine with each other, these elements are very unlike. Some, like nitrogen, are of an indifferent nature, manifesting scarcely any disposition to combine with other elements. Others, like oxygen have an active nature. They are strongly inclined to combine with others. Every case of ordinary combustion is an example of energetic combination of oxygen with carbon and hydrogen. The same process, or a similar one, takes place more quietly in decay. In these cases, oxygen acts as a destroyer. But it is equally efficient in building up. Indeed, oxygen presents the singular anomaly of an element ever busy in building organic structures, and then as if dissatisfied with its work, of pulling them down, and with their ruins building new ones. It is this element more than any other that causes that ever recurring cycle of change from life to death, and from death to life, which is going on about us; and it is impossible to have an accurate knowledge of the processes of vegetable growth without a thorough knowledge of this element. Possibly with such knowledge, one may not be able to understand vegetable growth, but it certainly cannot be understood without it.

When placed in peculiar conditions, these elements assume properties, different from those which they usually manifest. Thus oxygen exposed to substances undergoing oxidation, or to the electric spark, or to the galvanic current, assumes properties so unlike those which it usually has, as to appear to be a new element. In this state it is very energetic, combining even with those elements which usually resist oxidation. It is possible, even probable, that the nitric acid of the nitre beds, owes its origin to this energetic kind of oxygen; and it is possible too, when the relations of this substance to vegetation shall have been more studied, and better understood, that it will throw new light on the chemistry of organic life. The influence of this powerful agent in the interior of the plant can easily be conceived to be very great, and the field here for investigation, therefore, is very inviting and promises a rich reward. Other elements, by a change of condition, may indicate a change of other properties. For instance, sulphur crystallises in two entirely different forms according to the temperature to which it is exposed. The same is true of many other elements. Why it is so we cannot tell. But it is easy to conceive, in fact, it is difficult not to conceive, that the function of an element in the vegetable economy will vary with its changing properties. These new properties, peculiar to certain conditions, often gradually disappear, after the conditions cease in which they were induced. Elements in this state seem to be in a kind of unstable equilibrium, and ready to revert on the slightest occasion to their normal condition; like a wheel with an axis not exactly in the centre, always tending to a state of rest with the heaviest part downward. These peculiar properties, which the elements manifest, on the normal ones for the conditions in which they were induced; and were those conditions the ordinary instead of the exceptional ones, then these exceptional and unstable properties would become the permanent and normal ones, chemistry thus teaches us an intimate relation between the properties of an element and the conditions in which they were induced. They stand to each other in the relation of cause to effect, a fact, which we should do well to bear in mind and study its significance; for it is a type, which finds a fuller exemplification in the higher forms of vegetable life. The importance of an accurate knowledge of the properties of the elements concerned in vegetable growth is manifest. The more accurate and profound it is, the clearer will be our insight into the processes of life and the more will our views and theories be likely to be in conformity with truth.

But if a knowledge of the elements is important, that of their compounds is still more so, for it is mostly in the form of their compounds that the elements are introduced into the plant; and it is through the reactions of these compounds on each other in the interior of the plant under the action of chemical affinity modified by heat, light, electricity, etc.; that all the different organic compounds are elaborated. If we would trace them, step by step, the changes that take place in the plant, and understand them, be able even to anticipate and predict them, we must know accurately the properties of the substances that come into play. We must know the changes which these properties undergo under different conditions, and the effect produced by the varying intensities of the different forces. It will at once be seen that the subject is a complicated one. It is a problem in which all the quantities are variables. But its difficulties will not be in vain, if they impress the student with a sense of their magnitude, and nerve him to corresponding effort. It is only the fatal delusion of thinking we understand a subject, when we have penetrated scarcely beneath its surface that will effectually prevent all progress. Of one thing we may be assured, that no superficial knowledge, no simple gleaning of an idea here and another there, will ever extend the limits of this field of knowledge. Patient and persevering study is required to understand what has already been accomplished, and he, who shall grapple successfully with the difficult questions yet to be solved, will not only confer a benefit on mankind, but give the clearest proof of an intellect of the highest order, and of the severest discipline.

The next question is, whence are these elements derived, that is, where do plants get their food? There are only two sources, the soil and the atmosphere from which they can come, for these are the only objects, so far as we know, which sustain any relation to plants with respect to nutriment. But how shall we know whether the atmosphere furnishes plants with food? Evidently by analyzing it and ascertaining first whether it contains the elements that plants require, and secondly, if so, whether it really furnishes those elements to plants. As a matter of fact, the atmosphere consists of four elements, oxygen, hydrogen, nitrogen and carbon, the identical ones that constitute the great mass of matter in plants. These elements exist partly in the free and partly in the combined state. Oxygen, nitrogen, in the free state, make up the great bulk of the atmosphere, in the ratio of about one volume of oxygen to four volumes of nitrogen. This mixture of gases contains variable quantities of acqueous vapor and small quantities of carbonic acid and nitric acid and ammonia. Such is the constitution of the atmosphere. Now does it furnish plants with any of these substances as food? Experiment teaches us, it does. The very first step in the development of the embryo of the seed is accompanied with the absorption of oxygen from the air diffused through the soil, and when the plant has become sufficiently developed, one of the chief functions of the leaves, is to absorb carbonic acid from the atmosphere. It has been, and is yet, perhaps, a question, whether nitrogen, in the free state, is assimilated by the plant, or whether it enters the plant as a compound in the form of ammonia or nitric acid. In either case it comes originally from the atmosphere, the only difference being, it enters the plant in the former case as an element, in the latter as a compound.

But if the atmosphere furnishes plants with food, may not the soil do so as well? We learn from the analysis of the plant, that it contains certain solid constituents; and we learn from experiment, that these constituents are essential to its healthy development. The plant cannot thrive without them. They are, therefore, essential to the fertility of the soil, for the soil is the only source from which a plant can get them. This brings us to the Chemistry of Soils, and on this subject we have this question: Can Chemistry ascertain accurately the composition of soils? The answer to this question will depend very much on what is meant by composition of soils. If we include in the term those infinitely small quantities of substances, which must be estimated by the thousand or the ten thousand millionth part of the soil, then it must be confessed that the task would be both difficult and expensive; and yet these very small quantities of substances often have great influence on the growth of plants. I cannot better illustrate this fact than by referring to sea-weeds. They contain iodine. In fact they are the only source of the iodine of commerce, and they obtain this iodine from the sea-water. But the quantity of iodine in sea-water is so small, that it cannot be detected by any known reagent without evaporating a large quantity of water, although iodine is one of the most easily detected of the elements.—When in solution to the amount of not more than 1-300,000, it is easily detected by the usual reagents. Now, if one hundred cubic feet of sea-water be evaporated down to one cubic foot, not a trace of iodine can be found by the ordinary tests. This shows how minute the quantity of this element must be in sea-water, and yet the fuci and the algae absorb a considerable quantity of iodine, and owe to this element, probably, an individuality, which they would not have without it. Lithia, too, one of the alkalies has been found in sea-water, taken from the middle of the Atlantic Ocean, but it was necessary to evaporate some fourteen hundred cubic feet to find it. These facts will give some idea of the labor and expense accompanying the detection of these very small quantities of substances. At the same time, with the means of research now at command, very small quantities of the alkali and the alkaline earths can be detected, with far greater ease and accuracy than was possible ten years ago. In a mixture of these weighing not more than a few thousandths, or even a millionth of a milligramme, they can all be detected with ease at the same time.—In this way it has been found that lithia, which was formerly thought to be exceedingly rare, is very widely distributed in nature, being found in the three constituents of many granites, in limestones of different geological formations, in the spring water issuing from these formations, in the ashes of fruits that have grown on soils formed by the disintegration of these rocks, in the blood, the milk, and even the muscles of animals that have fed on these fruits. We conclude, then, from what has been said, that it is possible to find in a soil exceedingly small quantities of these substances essential to the healthy growth of plants, but that there is a limit at the same time, even with the aid of the spectroscope, beyond which it would not be advisable or practicable to go. In our general estimate of the value of chemistry as a means of ascertaining the composition of soils, we must bear in mind that a soil analysis of to-day, is a very different thing from what it was ten years ago, and that as the means of investigation become more accurate, the more valuable will chemistry become in its relation to agriculture.

But if chemistry can ascertain with great accuracy the composition of the soil, it is still necessary to begin with the analysis of the plant, for how else can we tell whether a soil is suited to the growth of a plant? Different plants vary in the quality and relative quantity of their constituents, and a soil that is fertile for one plant, may be barren for another. We, therefore, who analyzes a soil without analyzing the plant to grow on it, or at least knowing its composition, fails to see the relation of the one to the other. The plant then must be the starting point. And to illustrate, let us take the wheat plant;

and let it be a perfectly healthy, well developed plant, formed under the most favorable conditions, and of such a kind as we should like to see our fields covered with. We analyze it carefully, and ascertain its composition. We thus learn what materials are necessary to make a wheat plant, and at the same time, what materials a soil must have to produce good wheat. The soil may have other materials in great abundance, that contribute little or no food to the plant, and these materials may be very unlike in different soils, in fact they generally are, but the soil must contain as an indispensable requisite to fertility, those substances required by wheat as food. We do not say that a soil containing these substances will necessarily be fertile, but we do say, that it cannot be fertile, for wheat at least, without them. Their presence is one of the conditions of fertility, and but one. If they are present in such a state as not to be available to the plant, they may well be absent, for the plant can derive no benefit from them, and such is the case when they are locked up in undecomposed minerals, like feldsparmica, etc. Fertility then, implies not only the presence of elements required by plants as food, but their availability as such.

If now, we examine more carefully the analysis of the wheat plant, we shall find the number of constituents derived from the soil comparatively small, at least, those which need to claim our attention. For there are some constituents of wheat that are furnished by all soils in sufficient quantity for healthy growth, such, for instance, are iron, manganese, soda, silicia acid, and we may add probably magnesia. But there are others that are not always present in sufficient quantity for the wants of the plant. Among these may be mentioned potash, lime, phosphoric acid, and, perhaps, sometimes magnesia. The number will not usually exceed five or six.

Now, a soil that does not contain these substances is barren for wheat. If it had them once, and has been deprived of them by wheat raised on it many years in succession, it is now for the purpose of wheat culture no better than if it had never had them, and a farmer might just as well turn his sheep into a field of weeds or of sand and think to fatten them there, as to sow wheat on such a soil, and think to get a good crop. What then is to be done in such a case? Why, evidently, give the plant what it wants to eat; that is, add to the soil a mixture of four or five substances, that the plant wants to feed on, and if the soil does not become fertile, it will be from the lack of some other condition of growth, than food. If from any cause the farmer fail, either through want of knowledge or inability, to add these substances to his soil, and sees his crop diminish gradually from year to year until he gets only twelve or fifteen bushels, when he should have twenty-five or thirty to the acre, then he may conclude he is starving his wheat plants as truly as he would his cattle if he should give them only half enough to eat.

What has been said of the wheat plant may serve to point out the course to be pursued with any other plant. We must know its composition and then furnish the soil with what will nourish it. This is simply manuring; and hence we see that manuring is only the art of feeding plants. To do this intelligently and well we must know what they feed on, and in what form their food is best assimilated by them; and the relation of chemistry to agriculture in this respect is to teach us the proper kind of food to give them.

Another question yet remains, viz: in what form are those substances taken up by plants, as elements, or as compounds? Most of the elements occur in nature only in the form of compounds, and of those found in plants, not more than half a dozen are often found free. The inference therefore is, that plants take up the elements mostly as compounds. This is in accordance with a general law, that the higher the organism, the more complicated food it requires. The food of animals is more complicated than that of plants, and that of plants is, for the most part, not elementary. All the metals found in plants enter as salts. Potassium, for instance, as sulphate, carbonate, silicate, phosphate, or chloride of potassium; and so of the other metals, at least, those salts of them that are soluble in water. Carbon enters as carbonic acid, mostly through the leaves, but also more or less through the roots. Hydrogen passes into the plant mostly with oxygen as water, but also to a certain extent probably as ammonia and nitric acid. Phosphorus, with oxygen, as phosphoric acid; silicon, with oxygen, as silicic acid, and sulphur in like manner as sulphuric acid, pass into plants in the form of soluble salts. Chlorine enters the plant mostly in combination with sodium, as common salt. Much diversity of opinion exists with respect to the assimilation of nitrogen. Some believe that it is absorbed as a gas directly from the atmosphere, and assimilated as such; others, that it enters the plant as ammonia or nitric acid, and think they have in the action of ammonical manures, a strong argument in support of that view; others think nitrogen enters the leaves, and there coming into contact with ozone, is converted into nitric acid, or some oxide of nitrogen, and in this form is assimilated. It is not the place, nor have we the time here to bring forward the arguments and the experimental results which are adduced by the supporters of these different views, suffice it to say that the question lies wholly in the field of chemistry, and that if it shall ever be decided, it will doubtless be decided on strictly chemical grounds. Such, then, are the compounds that become the food of plants.

Another question of interest in this connection, is, the state in which these compounds exist in the soil, when taken up by plants. And here again a diversity of opinion obtains. It was formerly supposed, and is so now by many, that these salts, which constitute, in part, the food of plants, are in solution in the soil, and, circulating there, come into contact with the roots, and are absorbed by them.

But the opinion now entertained by some is, that these salts are not exactly in solution, but adhere, with a certain force, to other constituents of the soil, like humus, clay, lime, etc., and are thus retained, ready to be given up to the roots as soon as they shall come into contact with them. This force seems to be a feeble manifestation of chemical affinity, very like that by which coloring matters adhere to animal charcoal or to the fibres of cloth. There is, doubtless, truth in both these opinions; and a careful investigation of the subject will probably teach us that the food of the plant varies, not only in the quality and quantity of its constituents, but also in the condition in which it exists in the soil.

It may not be improper, in this connection, to say a word on conflicting views entertained by scientific men. In the judgment of some, such views are sufficient to throw doubt on all conclusions of science. It must be borne in mind that a new science, or a new application of an old one, is always accompanied with more or less mistakes, even by those best versed in it. The enthusiastic pioneer in a new field of knowledge will be exceedingly fortunate if he do not misinterpret some facts, and frame some theories, which will prove, in the end, more or less visionary. No mind, however keen its penetration, can comprehend at once all the bearings of a science in a new field of application. Hence we must expect some mistakes. And then, too, unless the scientific man is extremely cautious in his use of language, he will sometimes make loose statements, which, although intended to express facts in his mind, do really express something else, and mislead others.

But this is not the only difficulty. If mistakes have been made by the investigators of the principles of agricultural chemistry, how many more have been made by those who sought to apply them. With scarcely the rudiments of chemistry, and animated by the prospect of increased harvests, they have hastened to put in practice the principles. The conditions of their experiments have been as varied as quality and texture of soil, temperature and moisture could make them. Precautions, on which depend so much the success of experiment, have been neglected, either because they were unknown, or deemed unimportant. And thus experiment after experiment, made in this loose, haphazard way, has failed, as might have been predicted it would fail, and the failure has been charged to science, when it was due to the well meaning, but unskillful, experimenter. There can be no doubt that a large proportion of conflicting views and statements, on questions of agricultural chemistry, are due to bad experimenting. This is well illustrated by the beginner in the laboratory. He often fails in the simplest chemical reaction, because he has neglected some precaution, that is, some necessary condition.

His first impulse is to declare the statement false; but when he has learned how to do it, the discrepancy between statement and fact disappears, and he is surprised that so slight a variation in the experiment should have caused his failure. Is it then surprising that the same kind of bad experimenting extended over the whole field of chemistry, applied to agriculture, should lead to conflicting views?

The best way to obviate this difficulty is to become thoroughly familiar, not only with the principles of chemistry, but also with its practice. To experiment successfully without knowledge and experience, is just as impossible as to be an able, successful practitioner in any of the so-called learned professions without years of patient study.

Thus far we have touched only on the outskirts of the chemistry of the plant. Its constitution, its food and the condition in which its food is taken up, have been noticed. The next step would be to enter the laboratory of the plant, where this food is digested, and to study the reactions which take place under the action of chemical force, modified by heat, light, electricity and vitality—reactions by which the different organic compounds are elaborated. This is the field of vegetable physiology. Its province is the functions of the organs of plants. But these functions consist in large measures of chemical reactions. Take the formation of starch in the leaf. The materials of which it is formed are as unlike starch as they can well be. The carbonic acid is absorbed directly from the atmosphere; the water and the alkaline salts pass through the roots up into the leaf, and there in that little workshop, these substances, reacting on each other, produce starch, and this process continued, that is, this continuous reaction, constitutes a function of the leaf. Vary the conditions a little, that is, replace some of the reacting substances by others, or change their relative proportions, or vary the intensity of the modifying forces, and tartaric acid, perhaps, or some other organic product, might be produced. And so of all organic compounds. These infinitely minute changes of condition, either in the materials or the forces, on which may depend the nature of the product, can be learned only by the nicest observation and the most patient study. It is the want of a definite knowledge of these changes of condition, that renders the reproduction of organic substances in the laboratory so difficult. But if from the intricacy of the conditions which underlie the processes, we are as yet unable to imitate the processes successfully in the laboratory, they are none the less chemical processes, and show that the relation of chemistry to vegetable physiology is as intimate as its relation to agriculture. In fact, the formation of a plant from incipient growth to maturity, is largely a continuous and complicated series o chemical reactions, and the plant itself, in so far as it is the result o such reactions may be called a chemical product.

If then it be true that vegetable growth is largely a series o chemical reactions, resulting in the formation of the proximate con stituents of the plant, it is clear that chemistry must sustain a most important relation to agriculture, and deserves the careful study of all, who, in their husbandry, would derive from it the benefit which it is suited to impart. Because it has failed to fulfill the extravagant expectations, excited some years since by the writings of Liebig, we are not to infer that it is of no practical advantage to agriculture, and that the study and application of its principles in the growth of plants will be time and labor lost. Very many futile efforts have been made to reduce the gold from Colorado ores, but we are not to infer from this that chemistry is of no benefit to metallurgy. It is without doubt true that a subject of such complexity as the chemistry of plants has not been, and is not yet, well understood. Whatever difficulty there is, lies not in the chemistry of agriculture, but in our ignorance of it. As soon as we have an accurate knowledge of the conditions and laws of growth, and in our efforts to aid nature, work with, and not against her, then the discrepancies and apparent contradictions, always incident to a new science, or a new application of an old one, will disappear, and we shall have the greater cause to admire the wisdom and skill of Him, who evolves, through this interaction of materials and forces, the many forms of plant life.

FRUIT CULTURE.

Introductory Lecture by Dr. John A. Warder, of Cincinnati, delivered January 13, 1868.

In standing before you here to-day I feel that we are stepping upon the threshold of a new era, toward which some of us have been looking most anxiously for nearly a quarter of a century. Several of the noble citizens who first bestirred themselves upon the great subject of *Industrial Education* are still among us. The influence of their generous efforts has been felt by thousands, of whom many are here present to witness the results of their efforts in our Industrial University.

To them, to these, and to the great public, whom we hope to see deeply interested in the great problem of practical education, a few words may be addessed by one who has long been deeply interested in the subject, who, as a father, has again and again revolved the important question. How shall we best educate our sons and our daughters for the great business of life which lies before them? He hopes that his utterances will be received in the kind spirit which actuates him in presenting them.

Practical Education seems to be a very simple expression, and yet how few of us will agree as to what it shall mean! One may say that it is that education which comes through the fingers, rather than by the means of any of the other senses. It is that which we may learn by absolute practice while we are engaged in our daily work—that surely is practical enough—but it is not enough to satisfy some of us who desire to cultivate all the senses as well as that of touch, and the control of our voluntary muscles.

Others may claim for practical education, that it shall consist only in the instruction of the pupils in that kind of knowledge which will be of every day use, and they would eschew or condemn everything beyond this—alas! what limited ideas of this great desideratum that has exercised the thoughts of some of our greatest minds!

Some would teach mathematics only, as applicable to the various arts, while others will claim the supremacy of languages as the best method of developing the mental powers which are to be the means of improving all the arts.

We have writers who understand the subject who have given it their serious and studious attention, who know that whereof they affirm, when they give us as their ultimatum, that it is necessary to educate the whole man, in all his faculties to produce the perfect result.

To this proposition we must all agree, still, we demand *practical education*; and properly so, for it is clear that very few of us can ever by any possibility have the time, the patience, or the opportunity to become *perfectly educated.*

If asked to give a solution of this great problem, and to indicate how the important advances of science may be brought to aid the various arts of life, and reduced to the comprehension of those who intend to apply themselves to these several pursuits, in the great business of the world, I should with diffidence suggest that the greatest possible amount of good might be done, by inviting sensible and practical men, who are well posted in their special callings, and having them teach the classes—at the same time throw open the doors widely to all applicants for instruction, of whatever age or sex, and give them free choice in the selection of the studies they would pursue. Make the institution a university in fact, with its schools of chemistry, of physics, of mathematics, of botany, of geology, of zoology, and especially of mechanics and of agriculture.

The author of the act of Congress by which this noble grant has been provided seems to have similar views. Though a son of the pine tree State on our farthest eastern boundary, Mr. Morrill appears to have caught the true spirit of our prairie call for *Industrial Education*, and to have fully appreciated the very general desire manifested in other parts of the country for the establishment of institutions for practical instruction, which, it was fondly hoped, would supply the want that could not be satisfied by the classical colleges of the country as they were generally conducted.

Mr. Morrill assured me that if the States which accepted the grant made a mis-application of the endowment, they would be held responsible for the result. In his bill it is decreed that the tuition fund derived from the sale of the land shall forever be appropriated to the support of schools for instruction in *agriculture and the me-*

chanic arts, from which (it was added as a legislative fence-rider), that the languages should not be excluded, and that military tactics should be taught.

One after another, all of the sciences, chemistry, physics, and especially mathematics, will each claim a prominent place in a course of study that may be devised to carry out the spirit of the enactment of Congress; but, the truth must be admitted—we none of us know what we really want, what we need, what we can do, nor what we cannot do. A great experiment is before us awaiting its solution—we are setting out to build up from nothing, these great *schools of science*, schools *of applied science*, as Professor Gilman calls them—there are no well considered, nor well digested plans—there are no well prepared, well drilled classes to receive our instruction—and worse than all, there are few or no well qualified teachers for these schools of applied science, the very absence of such schools has made us two great orders of men, those who know only in the way of theory, and those who know only in practice—from either of these two orders we are forced to draw our teachers, and eventually, we hope to find the right men for the right places, it may be only after repeated siftings; therefore, my friends, your kind patience is craved on behalf of the devoted men who have nobly acted as trustees for this institution, next on behalf of us, their agents, who have the honor of being their appointees in the important position of teachers of the classes, whom your Legislature in its wisdom has directed to our walls.

Be gentle in your criticisms, and be just in your decisions, remember that our cause is an experiment, and that if it should not fully meet the wants of the people, your excellent board of trustees have it in their power to introduce such modifications as may appear to be necessary.

And now I beg your patience for a few moments, on my own behalf. When I accepted the honorable appointment of lecturer in this institution, it was with diffidence in my own ability to fill the station, as we all wish to see it filled.

To some of you, who favor me with your presence, it will seem as though nothing new was advanced in these lectures. Certainly nothing but well established truths will be taught—to some of you, my seniors in horticulture, these things are already familiar—but it is safest for a teacher to adopt the theory of the absolute ignorance of his class, this will induce and require him to descend to the most trivial minutiæ, which may weary the adept, but they are all-important to the novice. The course proposed for these lectures is planned upon this proposition.

Upon the present occasion I propose to occupy your attention with a few general remarks upon the following questions:

Why do not all of our farmers have plenty of fruit?

Why should all who live in the country grow fruit crops, just as they now produce grain, grass, and live stock?

The first question may be answered very readily, for most of those who have no fruits, it is simply because they do not try to have them, and this is the very natural result of their ignorance of the means of obtaining an abundance of these blessings upon almost every farm in the United States.

The latter question may be answered by enumerating some of the great advantages of fruit growing. These are primarily the *health* of the families of the producers; where fruits are freely consumed upon the table at all seasons of the year; next, the *pleasure* attendant upon their propagation, their culture, and above all, the satisfaction derived from the harvesting and consumption of these products.

It is a well established axiom in the medical profession, that the regular consumption of fresh, well ripened fruit, if conducive to health, and it is also a fact, that the * farmers of our country are not so *well fed* as they should be. This is nobody's fault but their own. True, they cannot have so great a variety of meats as those who reside in towns and villages, but they may enjoy the greatest profusion of fresh vegetables, and a succession of ripe fruits the year round, if they will but choose to take the trouble to plant and cultivate even a small portion of their land as a garden and orchard.

An appeal on behalf of fruit culture may also be made to the more sordid motive of money-making. No crops that are produced from the soil yield so great profits. The productiveness of small pieces of land appropriated to fruit culture is truly wonderful, and the money results in some cases are so great as to be worthy of the fashionable term of "fabulous."

It is well for the farmer to recollect that some of our fruit crops may be consumed with great advantage and profit by his stock animals. Hogs, sheep, cattle, particularly milch cows, and even horses, may be profitably fed upon some varieties of fruit. It has been asserted by a recent author, that "fruits of all kinds, but particularly what may be called the large fruits, such as are grown in our orchards, may be profitably cultivated for feeding our domestic animals. Sweet apples have been especially recommended for fattening swine, and when fed to cows they increase the flow of milk, or produce fat, according to the condition of these animals. * * * Orchards have been planted with a succession of sweet apples that will sustain swine in a condition of perfect health, growing and fattening simultaneously from June to November; and the late varieties may be cheaply preserved for feeding stock of all kinds during the winter." The farmer may also be reminded that portions of many farms can be appropriated to the culture of fruits, which are not adapted to crops that require cultivation on arable land. It has even been asserted that a given area planted with fruit trees, will sustain more stock, or fatten more pork, than the same space devoted to grain and forage crops.

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* See Dr. Flint's *Contributions*; published for the U. S. Sanitary Commission; pp. 18–667.

I propose to present some facts which will overcome the admitted ignorance referred to in the answer to the first query, Why do not farmers have fruits? In other words, briefly to point out, as a result of long experience and extended observation, *what plants to get, and how to set and tend them.*

The leading classes of fruits will be presented in the order of their importance.

The apple, prince of fruits, will first claim our attention. There is scarcely a farm in the United States, where it will not grow, and where some of its very numerous varieties will not succeed. In the extreme north, it may be necessary to resort to varieties of the most hardy character, such as the Siberian, and some other of Russian origin. In the south, many new varieties have originated from seed, which appear well adapted to that region.

PREPARATION OF THE SOIL—DISAPPOINTMENT FROM BAD SELECTIONS. Having assigned a portion of the farm to the apple orchard, which should be elevated, and of a light, porous soil, the ground should be well prepared by thorough plowing, if this be practicable, though it is found that fruit trees will thrive in newly cleared land, if set among the stumps; they have been planted on prairie sod, and there are many fine orchards on rocky tracts, where the preparation must be done exclusively with the pick, the spade, and the shovel. It may be the best economy for the owner of such land to appropriate it to the orchard, because it is unfitted for tillage crops. Even the holes for setting the trees may be made with the plow, by simply marking out the surface at the proper distances, and setting the trees at the intersections. This is done after the whole ground has been well prepared by a thorough plowing, and the trees are easily planted in the mellow soil in which they will thrive admirably. On low and flat lands that have no good natural drainage, tile should be used, if accessible, but even here surface draining may be done with the plow, by throwing the furrows together where the rows of trees are to be set, what the farmers call back-furrowing, two or three times, so as to make a little ridge to plant them on. This will also make open furrows between the rows, that will give outlet for the surplus rain water, or at least lead it away from immediate contact with the roots.

SELECTION OF TREES—VARIETIES.—Young trees are better for planting than older ones; small ones are more easily handled, and are surer to grow than larger ones. Two years from the graft or bud is long enough for the apple to remain in the nursery. This is true of most varieties, but there are exceptions to this, for some slow growing kinds require a longer period to attain sufficient size. The plants should be stocky and branched, and they should be taken up carefully, so as to preserve the roots.

VARIETIES are so numerous, and tastes so diverse, that it is almost impossible to make out a list of sorts that will be acceptable to all, and besides this, it is well known that the varieties which succeed in one locality may fail in another. Every planter should endeavor to ascertain what sorts have been tested and approved in his own neighborhood. Hardy and productive kinds, of second quality, are more satisfactory than those fruits of greater excellence, which have not these prime qualities of the tree. It is rare that we find all excellence united in one individual.

For the family orchard, it is best to have a succession in the time of ripening. The same is true of an orchard planted for stock-feeding, but in the commercial orchard, where a large quantity of fruit is to be produced for shipping, it is found best to plant only a few varieties, and these should be productive, hardy, and of such a character as to bear transportation and to command a ready market, less regard being had to the superior quality as table fruits than in the amateur and family list.

APPLE FAMILY—JUNE TO MAY.

Summer Rose, Primate, High-top Sweet, or Red Astrachan, Benoni, Summer Queen, Golden Sweet, Jefferies, Maiden's Blush, Lowell, Rambo, Wagner, Western Beauty, Jonathan, White Pippin, Ohio Pippin, Grimes' Golden, Winesap, Raule's Janet.

PLANTING.—After the ground has been prepared it is ready to mark off with the plow in two directions, so that the intersections of the furrows shall come at the stations for the trees. This is the best way to dig the holes, for the furrows may be made quite deep enough. Indeed, it is not desirable to set the trees deeply; some even advocate planting on the surface, and covering the roots with a little mound of soil, as is done when the trees are set on top of the sod of prairie or meadow. The distance between the trees will depend upon the habit of the variety. Some will require more space than others, but close planting has many advocates, who advance some cogent reasons for crowding the trees, instead of the wide planting of former years. A few of these may be mentioned: In the first place, it is now conceded that the land appropriated to the orchard should be given up to the trees, and not be used for other crops, therefore there is less necessity for space between them. In close planting, the whole ground is shaded, and kept from the baking influence of the sun, and thus remains more loose and friable than where exposed. The crowding of the trees also protects them, in a great degree, from the severity of the cold in winter, and from the injury incident to the sudden changes of our climate; but in exposed situations, this close planting especially shelters them from the trying winds.

The planting should always be done with the greatest care, the roots should be sprend out in their natural position, the finest soil put next to the fibres, and worked in among them with the fingers, so as to be in immediate contact both below and above them. When the roots are well covered, slight pressure may be made with the foot, especially toward the end of the roots; or, if the ground be dry, a few quarts of water may be poured upon it to settle the soil, and this should be covered with more dry earth. All that portion of the tree which was underground in the nursery must be covered, and, in fall planting, a little mound should be heaped up against the stem, to keep it from being swayed by the wind, as well as to turn off the rains from the roots. This mound may be removed in the spring.

CULTIVATION should be thoroughly kept up in the young orchard for a few years, and, at first, hard crops, such as corn or potatoes, may be allowed among the trees, but no grain or grass, nor any weeds, should ever be permitted among them. This cultivation may be continued four or five years, until the trees are well established, and begin to cover the ground with their shade, when the spaces between them will be so occupied by their branches as no longer to admit the horse and plow. The land may now be laid down to clover, not for a hay crop, but simply to cover the surface as a mulch, for which purpose it may be mowed and left on the ground.

TRAINING AND PRUNING.—These topics should be considered together since both have the same object—the forming of the head. The tree should be trimmed early in its orchard life, so as to produce the desired shape. It should be branched low, from two to four feet from the ground. The main limbs should be well balanced and well separated, while the leader must also be preserved; all interfering branches should be removed, and those which are too strong must be shortened in during the summer. All this will require some care and watchfulness, but will need the removal of very little wood, if it be done in time, while the tree is small, and this is the best time to do the work of pruning; midsummer is the best season, a strong, sharp knife and a pruning chisel the best instruments.

Pruning old orchards is quite another affair, and if they have been long neglected, the trees may need a very severe pruning to remove crowded, exhausted and decaying branches, in order to reinvigorate the organism by the production of new wood growth. The application of the saw will now be required, and the mild weather of fall, winter or early spring should be selected for doing the work. All large wounds must be pared smoothly with the chisel, and covered with some mastich to exclude the elements. In such trees it is sometimes better to thin out the branches and shorten them, than to remove the larger limbs.

Pears are delicious fruits, and every farmer should plant at least a few trees. The crops are certain, and any surplus may readily be disposed of. The old saw about planting "for one's heirs" must give way before the advances of pomology, for we now have many varieties in cultivation that are early-productive, and modern horticulture has furnished us with means of forcing early fruitage upon those varieties that formerly tried the patience of the orchardist by their long continued wood-growth, before reaching that condition of maturity that is attended by abundant crops.

The natural season for the maturing of this fruit being mid-autumn, we find as a result of cultivation and the production of new varieties, that this period has been considerably extended in both directions, so that the pear season now reaches from July to March or even longer. A very experienced student and propagator of this fruit has suggested that in thus departing from the normal season of ripening, we may expect to find, under the law of compensation, that we shall lose some desirable qualities. The truth of this is a matter of common observation, thus, in quality, most early pears are inferior to those of a later period, and the general inferiority of the latest or winter pears is a matter of common remark; there are exceptions in both extremes, but autumn is the season of the best pears.

SOIL.—Any good loamy land, with a predominance of clay, will produce good pear trees, and thorough plowing will be a sufficient preparation after draining, if the subsoil be tenacious and wet. The pear strikes its roots deeply into the soil; it is thus able to seek its food, and it is a gross feeder, but may thrive even on thin soils, at the same time it will be benefited by suitable manures. Analysis of its products shows that it needs lime and phosphoric acid; therefore bones may be applied with advantage to lands that are deficient in these elements. Planting and cultivation of the pear may be the same as that advised for the apple.

Dwarf pears have been very highly recommended, and largely planted; but the majority of planters now prefer to have their trees on free-stocks. These are often erroneously called *standards* in contradistinction to those being dwarfed by being worked on quince stocks. The dwarfs are very satisfactory for limited grounds, and should have high culture and good care in trimming and training to produce their best results. The two styles of trees should not be planted together, as has been advised; they require different treatment.

TRAINING.—Pear trees will bear crowding, as most of them are of an upright habit, fifteen or twenty feet apart is wide enough for the majority, and many will succeed much closer. The trees should not be grown as *standards*, with tall, naked stems, but do much better if trained from the first in conical form, when they are generally called *pyramids*. This object is attained by causing them to branch low, and by curbing the upper limbs, at both the summer and winter pruning, thinning them out and shortening them in such a manner as to keep the lower branches always the longest; the result will be the desired conical tree, which shall have all of its twigs, fruit and foliage well exposed to the sun and air.

CULTURE AND PRUNING.—The pear orchards may be treated like those of the apple, excepting that the general habit of the former is pyramidal, and of the latter globular, so that the pruning will require some modification, though conducted upon the same principles. While young, the ground among the trees should be well cultivated, but after they have attained some size, after six or eight years, they are found to do better in grass than if the cultivation be continued. These remarks apply to the pear upon free stalks, but those trees that are dwarfed upon the quince, or by severe and continued root-pruning will require high culture and even manure.

A select list of pears for family use from June till December:

Windsor, Early Butter, Doyenne d'Eté, Rostiezer, Tyson, Dearborn, d'Amalis, Bartlett, Flemish Beauty, Golden Butter, Autumn Melting, Sheldon, Duchesse, Beurre Diel, Figue, Vicar, Passe Colmar.

PEACHES are always acceptable, easily grown, and they come into fruiting at an early age, generally the third year. Unfortunately they are not constant bearers, as the flower buds are often injured by the severity of winter or by spring frosts. Peach trees will grow on almost any soil but light sandy or gravelly lands and elevated situations, seem best adapted to them. The trees should be one year old from the bud, cut back to a bare stem about two feet long before planting. They should be set from fifteen to twenty feet apart in the orchard, planted in the spring, and the ground must be cultivated continually to secure the best results. Mounding the tree has been advocated, but it is an expensive operation, the merits of which have not yet been fully demonstrated. There is a great variety of this fruit, both in its color, flavor, consistence, and season. There are clings and free-stones of all colors. The former are the best, the latter are most popular. The season extends from the first of August until the middle of October in this latitude. Those which ripen earlier or later are of less value.

The following lists are given under their classification:

FREE-STONES.

White Fleshed.—Early Tillotson, Early York, Hale's Early, Large Early York, Morris' Red, Old Mixon, President, Red Rare Ripe, Stump the World, Ward's Late.

Yellow Fleshed.—Barnard, Bergens, Columbia, Crawford's Early, Crawford's Late, Red Cheeked Malacoton, Smock, Yellow Rareripe.

CLING-STONES.

White Fleshed.—Baltimore Rose, Grand Admirable, Heath Cling, Large White, Old Mixon, Rodman's Red.

Yellow Fleshed.—Leeman Cling, Orange Cling, Tippecanoe, Washington.

Deep Red Flesh.—Blood Cling or Claret, Blood Free.

THE PLUM is so sadly affected by the Curculio that few of us know how excellent a fruit this is. Occasionally the rascals stand back and thus we get a crop, and some cultivators have succeeded in counterworking the enemy so as to preserve their fruit. Trees planted in trodden places near houses, have escaped the attacks of these insects, and have borne crops for many years, so that farmers are urged to continue planting plum trees in such situations. There are some varieties, however, which appear to escape these invaders, among them the little Damson, which is well worth cultivating, as it makes good preserves.

The following select list is recommended for those who would plant plums:

Early Orleans, Lombard, Green Gage, Prince's Imperial, Reine Claude de Bavay, Yellow Gage, Washington, Coe's Golden, Smith's Orleans, Damson.

CHERRIES.

This delicious fruit appears to be more fastidious as to soil than any other, for though it will grow almost anywhere, it does not stand well on our rich limestone lands. Those soils that are natural to the chestnut appear to be the most suitable for cherries.

There are some very hardy varieties that seem to do equally well on any kind of land; these are called the *Dukes* and *Morellos*, they are mostly sour, and are chiefly valuable for cooking cherries; may be planted ten, fifteen or twenty feet apart, according to their class, as Morellos, Dukes, or Hearts and Bigarreaus, the last being the largest. The trees should not be too old when planted, two or three years from the bud or graft is enough. They should be headed back, so as to branch low, and should be grown as pyramids. All the pruning should be done while they are young, as they do not readily heal over the stump of a large limb. These trees are very apt to split and burst their bark, especially where the stems are exposed to the sun by trimming them up as standards, hence the importance of low heads. This accident is most common in the free growing kinds and in rich soils.

The following varieties are worthy of culture:

***Heart cherries.*—American Heart, Governor Wood, Black Tartarian, Coe's Transparent, Doctor, Purple Guigne, Black Hawk, Black Heart, Burr's Seedling.**

***Dukes.*—May Duke, Belle de Choisy, Belle Magnifique, Carnation, Louis Phillippe.**

***Bigarreaus.*—Elton, Cleveland, Rocheport, Yellow Spanish.**

***Morellos.*—Common, Early May, English, Kentish, Early Richmond.**

QUINCES have been too much overlooked by our farmers, who could not present their families with a more acceptable offering than the fruit from a few trees planted in some low spot of rich moist soil, such as that which receives the slops and drainage from the dwelling house.

These trees are rather hardy, and will occupy little space, as they never grow large, and can be planted eight or ten feet apart. They should be trained to one stem, branched about three or four feet from the ground, and kept trimmed to open heads. The common variety is the *Orange*, which ripens in September, while peaches abound. The *Portugal* or pear-shaped, and the *Angers*, have smaller fruits which ripen later, in all October. The largest fruit is *Rea's Mammoth* or *Coxsackie*, recently introduced and very highly recommended.

GRAPES.

Every farmer, every cottager, every householder or houseruler, should plant a few grape vines. It is a very simple affair, requiring no great amount of skill nor labor to plant, train and trim a grape vine, and its productiveness of fruits that every body, young or old can appreciate is proverbial. Who has not heard of the famous grape cure? Who can object to trying it? Certainly not he who has planted and trained his own vines.

Almost any soil that has been deeply loosened, and moderately enriched will cause the grape vine to grow luxuriantly. It may be set in out-of-the-way places, trained to a stake or a trellis, or be made to climb beside the walls of out houses, and cover their bare sides with foliage and fruit, rendering them ornamental instead of ugly.

Training the young vines in an upright direction to encourage their growth, and at the same time concentrating their force into one or two shoots, by pinching or rubbing out the others, is a very simple affair, and light labor. Pruning them when dormant, cutting them back to two or three eyes in the fall or winter, is no great mystery. The same process of training two strong shoots the next season is but a repetition of the first summer's experience, with more satisfactory results; and the second fall, with canes nearly as large as the little finger, the pruning is less severe, because we now have bearing wood, which needs to be shortened-in two or three feet in a strong vine. These canes are to be trained horizontally, as the arms of the vine, in which condition they may be left for years, unless they need renewal. In the third, and all succeeding years, we must still train the shoots upward, taking care only to remove the superabundance of the growths, by rubbing out, early in the season, and leaving one shoot, say every nine inches, which must be trained upward. In the fall of this year, we commence pruning these shoots for alternate production of fruit and wood, by cutting one cane about two feet long, and reducing the next, the weaker, to a spur, with only two eyes or buds. In this way the bearing wood of the vine is constantly renewed. The mystery disappears when we recollect that all the fruit of a grape vine is produced upon green shoots that grow from the cane of last year's growth. By renewing these shoots annually from below, we can have bearing wood to cover the trellis, and strong new shoots to clothe the whole with abundant foliage. Various modifications of pruning and training have been suggested, and may be practiced, but the most simple, common and successful is the one indicated above. All depend upon the annual reproduction of new wood from which to draw our supplies of wood from year to year.

In the multitude of grapes that are now offered to the public, almost any tastes may be gratified, and yet for the most satisfactory, because certain, results, we are safe in selecting a few well known varieties that we can recommend to our farmer friends:

Hardy and productive—Concord, Hartford, Ives, Clinton, Martha, (white).

Not always healthy—Creveling (very good) and Catawba.

Juicy grapes, very best—Delaware, Iona, Israella, Isabella, Diana, Herbemont, Alvey, Elsinboro.

SMALL FRUITS.

We now come to the consideration of the *small fruits*, which, however, may constitute a very large share of the food, comfort and luxury of a well regulated family, either in the country or city, and which will contribute in no small degree to the healthiness of the people, by substituting their grateful acids and sweets for the calomel, ipecac, tartar, soda and potash, in various forms, that are so freely drawn from the druggist's shelves, either for the cure or production of disease, according as they are administered by the doctor, or by the cooks.

THE STRAWBERRY

Comes first in the order of the season, and indeed it is the most universally welcomed and relished of them all. The cultivation of this fruit is so simple, and the returns so speedy and so grateful, that it should occupy a prominent place in every farmer's garden. This fruit will grow in almost any soil,but a good stiff loam, well stirred, is probably the best. The strawberry plants should be well rooted runners, or offshoots from an older plantation; they should be taken up carefully, so as to have good roots. If these have been formed in small flower-pots sunk near the parent bed, so much the better, as the fibres, being confined by the pot, will be less disturbed in transplanting—or the ball may be set entire.

Strawberries may be grown in hills, in rows, or in beds. The latter is the common method, and the beds are formed by planting two or more rows a foot or fifteen inches apart, setting the plants twelve inches one from another in the rows. In the beds, the runners are allowed to grow, and to increase the number of plants indefinitely, so that they are often injured by being crowded too closely together. When planted in hills, they are set eighteen inches apart; the space between them is kept perfectly clean, and the runners are cut as soon as they appear. This results in the greater growth of the original plant, which has an increased number of crowns from which the blossoms and fruit proceed in great numbers. This method enables the producer to have the best possible results in the size and appearance of his fruit, but it is attended with more labor and expense than the bed system. Many cultivators prefer planting in rows, when they set the strawberries about a foot apart, and place the rows two feet or more one from another, according as they expect to use plows or hoes in their culture. In the narrow rows the runners may be cut off, and the fruit will be almost as fine as that grown in the hills, but in the wider rows the runners are generally allowed to strike root, and spread the row into a bed in the course of the first summer after planting.

Spring is the best time for setting out the plants, though this may be done at any time during the growing season. The advantages of early planting are the longer period allowed for the stools to grow and become thoroughly established in the soil. The plants are set by the line, a hollow is opened with the trowel, in this the roots are spread out, then covered with mellow earth and pressed firmly with the fist or even with the heel. If watered at once, a little fresh earth should be thrown in to prevent the cracking, but great care must be taken to avoid placing the crown below the surface of the ground—in other words, the roots must be planted and not the corm, from which the crowns arise. Thorough culture should be given through the season.

Mulching, with old rotten manure, applied after planting will encourage the growth of the strawberries, and keep the soil moist.—Winter mulching with clear straw, leaves, or other material should be liberally applied after the ground has frozen, and be left to protect the buds during the winter, and to be removed from the crowns of the plants in the spring. Being left between the rows, the straw will make a good summer mulch, and keep the fruit clean. In hill culture, saw dust and old tan bark have been recommended, and still another material, spent hops from the brewery, has been used with excellent effect.

Strawberries have a peculiarity in their blossoms, from which they have been classified as *Pistillates*, *Staminates*, and *Hermaphrodites*. In the first class, the stamens are so defective that the flowers need the fertilizing influence of other kinds which must be planted near them. These furnish many of our favorite varieties, especially those which are largely cultivated in beds. The next class embraces most of those sorts which produce the largest berries, their flowers are often so deficient in the pistils that a large per centage of them fail to set fruit. This is particularly the case when these varieties are grown in beds and allowed to multiply their runners. They are, however, quite productive when cultivated in hills, and they have formed branching crowns from which spring numerous trusses of flowers. Beside these two classes there is another, in which the two sexes are so evenly combined that almost every flower is followed by perfect fruit, a very few varieties of the strawberry either cultivated or wild belong to this group. These different classes will be indicated in the list by the letters P. S. and H.

Agriculturist, H.; Austin, S.; Burr's New Pine, P.; Dr. Nicaisse, S.; Extra Red, P.; Fillmore, P.; Golden Seeded, S.; Hovey's Seedling, P.; Jucunda, S.; Longworth's Prolific, H.; Necked Pine, P.; Russell, P.; Superior, P.; Triomphe de Gand, S.; Victoria, S.; Washington, S.; Wilson's Albany, H.

Raspberries.—Next to the Strawberry, and nearly allied to it in its botanical relations, is the Raspberry, which furnishes a fruit of high flavor and exquisite fragrance. It is no wonder that this should be a favorite with all fruit-growers, since it is easily produced, hardy, makes quick returns, is easily gathered, and commands a ready sale at high prices. And yet it is equally surprising that so few farmers' gardens are stocked with the raspberry.

Every soil that is cultivable will produce this fruit, but a good loam is best adapted to it. The only preparation requisite, is ordinary plowing of the land, but deep cultivation and manuring are well bestowed upon the raspberry patch, and it should be kept clean by thorough summer cultivation.

The raspberry may be planted in the fall, but the early spring is generally preferred. They may be set about three feet apart, in rows that are from six to nine feet wide, or planted in hills five by five feet, or wider for some of the larger kinds. Planting in rows is usually preferred, but the hills allow of cultivation in both directions, or cross plowing, which saves hoeing, and also permits the pickers to get among the plants more readily.

Trimming the raspberry was formerly done only in the winter, and consisted in shortening the canes, and removing the old dead wood, and the surplus feeble shoots, so as to leave from two to four on each plant or hill. This was done at any mild time between October and February or March. Fall pruning, if done too early, may prove very injurious, if followed by mild growing weather that causes the buds to grow, and thus destroys a portion of the next year's crop. Of course, it is understood that all the varieties and species of this genus, *Rubus*, including the raspberry and blackberry, produce shoots one year that become the bearing canes of the next summer, and then die; an apparent exception exists in the autumnal bearing raspberries, which produce blossoms and fruits upon the shoots the season of their growth.

Summer pruning is now practiced by all good cultivators. This is a very simple operation, and consists in pinching or cutting off the shoots as soon as they are two feet high, which causes them to branch out with strong laterals, and these are to be cut back according to their strength, in the winter. By this means the plants are made more stocky and bushy; they resemble little trees, and are able to bear enormous crops. At the same time, all redundant branch shoots are to be cut away. This method also obviates the necessity for any kind of support, such as stakes or trellis, since the sturdy plants are able to stand alone.

We have two American species of eatable raspberries, the *Strigosus* or red fruited, and the *Occidentalis*, or thimble berry, the black caps. Besides these, the European species, the *Idæus*, furnishes many delicious raspberries, most of which are tender and need winter protection:

Black Caps.—Thornless, Doolittle, Miami, Purple Cane.

American Reds.—"Red Antwerp," Kirtland, Clarke, Philadelphia.

Foreign—Red Antwerp (true), Brinkle, Hornet, Pilate, Franconia, Naomi (new).

BLACKBERRIES.

The blackberry, though abounding in most parts of the country, is entirely deserving of care and cultivation. In the garden it is under our control, and may be allowed to reach perfection, by hanging until perfectly ripe, which is not the case that must be yielded to the "eminent domain" of any vagabonds who may come along and trespass on our farmers, and glean the fruit from our neglected fields and fence-corners.

Any rich, deep soil, well plowed, will suit this fruit. The plants should be allowed plenty of room, and may be set every four feet, in rows eight or ten feet wide. The ground should be well cultivated, or deeply mulched, and the suckers must be kept down, by cutting them with the hoe whenever they appear between the rows, and these should not be crowded—one stalk every two feet will be sufficient. This being only another species of the genus *Rubus*, or bramble. The remarks as to the habit, and pruning of the raspberry are applicable to this species, and need not be repeated, except that the summer pruning should be practised a little higher, say from three to four feet, according to the vigor of the plants, and the redundant shoots must be cut off.

Black.—Dorchester, Thornless, New Rochelle, Wilson, Kittatinny, Missouri Mammoth.

Light colored.—Chrystal (white), Orange (rose).

THE CURRANT.

In almost every log cabin garden we used to find this health-giving fruit, which offers its agreeable acid in the heats of summer as an antidote or preventive of the billious effects of our torrid season. And yet the currant is a sadly neglected fruit, and in many parts of the country there is not enough for home consumption.

This being a northern plant, it is thankful for a partial shade or protection from the scorching sunshine (in latitude forty or southward). For this object it is well to plant the bushes on the north side of a fence or building, and even in the shade of young orchard trees, where they sometimes succeed very well for a long period, even after the apple trees have occupied and shaded the whole surface.

The currant delights in a deep, rich loam, and will thrive even where the soil is somewhat moist. The bushes should not be crowded, as they require about four feet space, each way.

TRIMMING is to be done in the fall or winter, as the buds swell very early in the spring. It should consist in shortening two or three of the strongest young shoots, cutting away all the weaker ones, and removing only the oldest and exhausted bearing wood. Unlike the raspberry, currants do not fruit on the young shoots, but upon little spurs that appear only on branches that are two or more years old.

The plantation must be kept clean, and free from grass and weeds. After cultivation in the spring, it is a very good plan to cover the soil with a heavy coating of old hay, straw, fodder, leaves, or other suitable mulching material, which will retain the moisture, and preserve the fruit a long while in fine condition.

VARIETIES.

Common Red, Red Dutch, White Dutch, White Grape, Versailles, Cherry, Black Naples.

GOOSEBERRIES.

Fashion has wonderfully affected the production of this fruit. The fine, large, English varieties were generally so badly affected with a mildew, that their culture was abandoned, except by a few fortunate persons. The introduction of the Houghton, and American red varieties worked a revolution—every body planted them, and everybody purchased them at high prices for several years; when lo! the cost of sugar caused a change, and the demand fell off to such an extent that the plantations were rooted up, and there was no longer any sale for the plants, and nurserymen discontinued their propagation. Gooseberries are just as valuable, nevertheless, to the farmer's family as ever they were, and their cultivation is so simple that they may and should be grown in every household garden, and by every cottage.

GRASS.

A lecture by Dr. L. D. Morse, of St. Louis, delivered at the Illinois Industrial University, Januarg 14, 1868.

The subject assigned me on the programme, is "Grass." Some of you, I presume, probably most of you think that it is a small subject, and comparatively unimportant. Certain it is, that farmers in general bestow much less thought, care, study, or science on the grass crop than they do on the grain crop. How many farmers know the names of the grasses which are growing in their fields? Not one in ten thousand. Many of them seem to be scarcely aware that they have or need to have any other varieties than Timothy, blue grass, clover, and rarely a little red top; and of course, they do not understand the peculiar properties and relative values of the different species, and their adaptation to various soils and conditions, and for various purposes.

Instead of my subject being of minor importance, I suspect that it would not be difficult to show that it is by far the most important of any subject that has been or will be brought to your attention during the present course of lectures. In order to present a few of the prominent features of the subject, I propose to consider,

1st. What is grass?
2d. The importance of grass.
3d. How to grow grass.
4th. Some of the varieties of grass.

1st. Grass is the most common herbage with which the earth is clothed; giving us the "grassy banks," "wavy meadows," "sweet fields arrayed in living green," and the "green things growing" of which poets have sung from time immemorial. Grass is so common, so extensive, so beautiful. so essential in the landscape, and important to the welfare of mankind, that scarcely a poetical production of rural character can be found in which allusion to grass is not made.

The family of grasses, in botanical language the *Graminæ*, embraces nearly a sixth part of the whole vegetable kingdom. Most of the grains, as wheat, rye, corn, barley, rice, etc., are true grasses. In common speech these grains are not recognized as grasses, while some other plants, such as the clovers, and lucerne are familiary called grasses, but are not entitled to the appellation, belonging as they do to quite another family, the *leguminosæ*.

The grasses may be described as plants having a cylindrical, jointed stem, the nodes being solid and the intervening joints hollow, or filled with a pith like substance; the leaves long, narrow, not serrated at the edges, having parallel veins running along on each side of a prominent central vein or midrib; the leaves alternate, one of them originating at each joint, embracing the stem with its base, and forming a sheath which is slit down on the side opposite to the leaf to its origin; and the flowers are protected by a peculiar kind of calices, called glumes or husks.

Guided by this description, it will not be difficult to recognize the true grasses wherever found, and it is readily seen that the grains mentioned belong to the grass family. It will suit our present purpose best, however, to leave the grains out of consideration as grasses, and to include the clovers among the grasses, as they are, to a considerable extent, so understood and used for the same purpose.

A forcible and expressive definition of grass is that given by a French writer, who says that the term grass is only another name for beef, mutton, bread and clothing. A short and comprehensive definition is that of scripture, "all flesh is grass." A well known New York author, in an address at an agricultural fair, a few years ago, said:

"Grass is king. It rules and governs this world. It is the very foundation of all commerce. It is the most important crop ever grown upon the face of the earth. Without it the earth would be a barren waste, and cotton, gold and commerce all dead. Grass is the all in all to all men.

"No wonder then that he has always been considered a wise man who said: 'He that maketh two blades of grass to grow where only one grew before is greater than he who buildeth a city.' That is, builds a mart of commerce—a store house for cotton—a place of deposit for gold."

IMPORTANCE OF GRASS.

2d. The importance of grass is already quite well indicated. It is found growing throughout the world, in all places where vegetation of any kind can grow, and where grass is not found, there is found the most absolute desert—the most entire absence of the means of supporting life of any kind. Other families of plants are restricted to narrow belts of latitude, but the grasses everywhere spring up spontaneously, adorning the earth with refreshing verdure, and affording the chief means of subsistence for almost the whole animal creation.

An All-wise Providence has wonderfully provided for the propagation of this class of plants. The seeds are small, light and easily transported from one place to another. The roots are creeping or fibrous, and send forth many shoots which quickly cover the ground; and by the yearly decay of the stems and leaves a constant supply of decomposing matter is afforded for the nourishment of future growth. Most of the grasses are perennial, and although the leaves and stems be cropped and destroyed, they are soon reproduced. The creeping roots, though bruised and hurt, are not destroyed, and the winter's cold and summer's drouth are alike unable to extinguish the principle of life in these most important of all plants to mankind.

The great value of the grasses is further signified by the wisdom of Providence in the great number and variety of the species which he has created. There are no less than three thousand distinct varieties known and described by botanists. Thirty varieties have been counted in a single sod taken from a rich natural pasture. Mr. Flint, author of "Grasses and Forage Plants," describes one hundred and twenty-five varieties growing in the State of Massachusetts. In the Natural History of New York, Professor Torrey describes forty varieties of the genus *Poa*, twenty seven of *Agrostis*, six of *Alopecurus*, fifteen of the *Festucas*, and thirty-four of other varieties, amounting in all to one hundred and twenty-two varieties existing in the State of New York.

Six-tenths of the whole cultivated area of the State of New York is occupied by grass; and the annual value of this crop may be fairly estimated at $75,000,000; an amount fully equal to, and probably exceeding the value of the entire grain crop of that State. Where within the United States can be found more beautiful or more wealthy localities than in the best grass-growing districts of New York? How often do we hear the remark from men who have traveled much and observed closely, "wherever you find a good grass farm, you are sure to find wealth and prosperity." Mr. Samuel L. Boardman, of Maine, has written as follows: "A district of country which is exclusively or mainly a natural grass-growing section, has within itself all the elements of successful agriculture, provided its operations are conducted with system and economy. With grass we have all kinds of stock; with stock the means of working and dressing our farms, furnishing our tables, providing our clothes, and all else that is desirable or necessary. A county having a soil naturally adapted to grass, is, in a great measure, able to live within itself, and not be dependent upon an exchange of commodities with other districts. The same is true, though in a less degree upon a single farm. If the soil is natural to grass, strong and moist, the farmer has at hand the means to secure whatever he desires; or to apply the old proverb, he has corn, cattle, and manure. In fact, grass and stock husbandry is really the only branch of farming which seems to render a man independent."

A committee of the Maine Board of Agriculture, reported to the board in 1864, as follows, "we have no hesitation in saying, that the hay crop of our State is far the most valuable and important crop that we produce, and generally all our farm operations, particularly in the older portions of the State, should be conducted with a view to increase the fertility of our grass lands, and augment the hay crop. We believe that the thrift of those who attend to farming exclusively, and who pursue a mixed husbandry, as do most of the farmers of this State, may be very correctly estimated by the amount of hay they cut."

Scores of such opinions as these could be given, and there are ample facts to prove that they are well founded. If so, then it is evident that the most serious and radical defect in our Western agriculture is that too little attention is paid to growing grass. It is a defect that is becoming year by year more serious; and unless a change in our system of farming is inaugurated, the utter impoverishment of a very large portion of our beautiful and naturally fertile country is merely a question of time. Indeed, a number of counties in the State of Illinois are already measurably worn out and exhausted by bad management, and chiefly by the continual cropping with grain.

Illinois is claimed to be the best agricultural State in the Union. It has been called a great cattle raising State. Statistics show that it is most emphatically a grain producing State. Illinois produces annually over ninety bushels of grain to every individual of her population; while the State of New York produces only about nineteen bushels to each individual of her population. New York is a wealthy and very prosperous State. In her agriculture, I think it will be generally admitted that she is in advance of any other State in the Union. Her farmers generally pursue their calling with as great a degree of intelligence and success as the farmers of any region on this continent. It becomes an interesting inquiry then, in what consists the prosperity of New York, while she produces but little more than a quarter as much grain in proportion to population as Illinois.

In comparing other products the proportion cannot be so readily adjusted as with grain. Illinois is larger than New York in area, by some ten or twelve thousand square miles. The population of New York numbers a little more than twice as much as Illinois. According to the census of 1860, Illinois raised considerably more than twice as much grain as New York, the figures being, 156,219,448 bushels in Illinois, to 72,890,861 bushels in New York. Illinois produced 1,774,554 tons of hay to 3,564,786 in New York, or about half as much. There are more acres in pasture in New York than in meadow. In 1865, the figures were, 4,296,720 acres of meadow, and 5,819,694 acres in pasture. If the yield from the pastures is worth as much as the yield from the meadows, then the grass crop produces more money probably than the grain crop in New York State; while in Illinois, estimating by the same rule and at the same rate, which is much too liberal, the grass crop is not worth half as much as the grain crop. In 1860, the live stock in Illinois was valued at $72,501,225; in New York, at $103,856,296. Illinois had 522,634 milch cows, while New York had 1,123,624.

It appears that in all products from grass, New York is largely in excess of Illinois; and yet, not very much in excess of her own grain crop in value. She practically recognizes the old Belgian proverb:

"No grass, no cattle; no cattle, no manure; no manure, no crops."

It appears evident, also, that the farmers of Illinois depend for their profits chiefly upon growing grain. This is sent away to market; most of it finds its way to the Eastern States, and not a little of it goes eventually to enrich Eastern grass farms. Of course, it brings money to our farmers, though it is doubtful whether it brings as much for the time being as grass would, but the most important point which should be considered is, the end to which such a course inevitably leads—such a continual sending away of the wealth of the soil never to return.

You have all heard of the peasant who possessed a goose that every day laid a golden egg. This small supply of gold was sufficient for the daily wants of the peasant and his family, and their only care was to preserve the life of the remarkable animal from which they derived their support. But at length the peasant, stimulated by unnatural desire, required more gold, and unwilling to wait the tardy operations of nature, cut open the body of the goose to obtain the coveted treasure, and thereby killed the animal and lost his means of support.

The soil is the goose that annually lays a golden egg in the lap of the farmer, and will continue to do so to all time if properly fed and tended, but the practice of many of our grain farmers will as surely starve and destroy the goose as did the knife of the peasant in the fable.

The preservation of the fertility of our soils, and the profitable and even increased production of the cereals, both of which objects may be secured by the growing of grass extensively, and by the manure resulting therefrom, are certainly matters eminently important and worthy of our consideration and study.

"The effect of grass on the growth of the cereals is well illustrated by a comparison of the agricultural statistics of France and England. France has fifty-three per cent. of its cultivated area under grain crops, while England has but twenty-five per cent.; but in grass and meadow, the natural food of live stock, England has fifty per cent. and France has only twenty-two per cent. You may be surprised to hear, that notwithstanding the enormous disproportion of area of grain land, England produces 5 1-9 bushels of grain for every individual of her population, while France produces 5 ½ bushels for every individual of hers. Thus the production of the former is within seven-eighteenths of a bushel of the latter to each head of her population. How is it that England is so nearly on an equality of production with France, while her cultivated area is very much inferior? The answer is plain. It is on account of the manure furnished by her grass lands. Every acre of English grain land receives the manure from three acres of grass, while in France the manure from each acre of grass must be diffused over two and a half acres of grain. Let not the eloquent teachings of these plain statistical statements be lost upon us. Let us ponder them carefully when contemplating the splendid rewards which nature offers for a thorough obedience to her laws." (Address of J. Stanton Gould.)

HOW TO GROW GRASS.

3d. It is not the simplest thing in the world to grow grass with complete success, though judging from the examples most commonly seen, it might be presumed that it is generally so considered. Without going very much into the details of grass growing I wish to mention a few essential considerations, most of which are too commonly neglected or overlooked.

First, underdraining on a large portion of our lands is essential in order to secure the best results in grass.

On all heavy soils, with retentive clay sub-soil, that hold the water that falls until it evaporates, and on such lands as are full of springs, the grass crop will be doubled, on an average, considering quality and quantity, by underdraining. It deepens, ærates, warms, and enriches such soils in a wonderful degree, making them capable of withstanding the effects of cold, wet weather, and especially it enables them to go through the long, scorching drouths without material injury to the crop of grass. It is expensive, but when well done, will last a life-time, and the increase in production will very soon pay the cost.

In the second place, it is essential that the ground be properly prepared for the reception of the grass seed. It should be smooth, in fine tilth, and free from weeds and foul growths of all kinds. We rarely find a pasture or meadow that is not more or less filled or infested with noxious weeds or worthless grasses. These occupy and take the strength of the land, continually encroaching upon the valuable grasses until the pastures and especially meadows, become almost worthless from the abundance of "white weed" and other trash. He is not a successful grower of grass whose pastures and meadows are thus infested.

Plowing in mid-summer, the summer fallowing as sometimes practiced, puts the land in good clean condition for seeding to grass in

August or September. A crop of sowed corn may be grown to the height of a foot and a half, and then turned under with the plow, if desirable, affording manure and clean land for seeding. Sowing grass seed upon oat stubble, as I have found, is practiced in this immediate vicinity, I think must be an excellent plan. The oats if sown in February or early in March as they must be to succeed well in this latitude, and especially South of this, get an early start and quite effectually choke out most of the weeds. Then, if the grass seed be sown on the stubble early in September, either with or without harrowing, it gets a good start before winter, and the oat stubble and the young oats that start from the seed scattered in harvesting, afford some winter protection to the young grass. Good success is sometimes obtained by seeding to grass in February or March, but is generally considered much more uncertain, and so also is the practice of sowing grass seed with grain.

These hints in regard to preparation for seeding apply generally to meadows, and in most cases to pastures. Circumstances alter cases. There are hill lands that may be properly seeded to grass as soon as cleared, without plowing even, and kept constantly in grass. Weeds, sprouts, etc., may be killed out of such pastures by mowing or cutting out, or much better by pasturing with sheep. Our unbroken prairies may be seeded with grass, and thus converted directly into better pasture or meadow than they were before; and in a few years the tame grasses will almost entirely take the place of the wild.

One very important cause of lack of better success in growing grass, is that farmers do not sow varieties enough. This is true in more than one sense. Different varieties should be chosen for different objects, for difference in season of ripening, and different soils. Again, a mixture of varieties should generally, if not always, be sown.

Some of the grasses flourish on dry sandy or rocky soils, but perish in wet soils; others grow vigorously in wet soils, but die in drier ones. Some will only flourish on alkaline soils; some require excess of potash, others excess of light. Some are adapted to the sunlight, others love the shade; some are valuable for hay, but not for pasture, and vice versa. One species abounds in that kind of nutriment which enlarges and strengthens muscles; another, ill adapted to nourish the muscular tissues, will lay on fat rapidly; another which is deficient in both these respects, is rich in those elements which support respiration and furnish the fuel for the production of animal heat. Certain varieties are highly valued for making a superior quality of butter. It seems very evident that in the judicious selection of different varieties of grass, to occupy different localities, and to subserve different purposes, a wide field is afforded for the application of physiological, botanical, geological, meteorological and chemical knowledge. It is the province of practical agriculture to find out the peculiar qualities of each variety, and to place each in the locality and under the circumstances most favorable for its most profitable development.

We should sow a mixture of varieties, for several reasons: one is that it is an object to produce as much good herbage from the land as possible, and at various seasons; another is the importance of occupying the ground as completely as possible with valuable grasses, so that noxious weeds and worthless grasses will have no chance to get a foothold. It is an established fact, and one easily demonstrated, that one or two varieties will not perfectly occupy any soil. This is the rule, to which there may be exceptions. Different soils vary in the number of plants of a certain variety that they are capable of maintaining; yet, on any soil, however thickly the seed of a variety may be sown, only a certain portion of the plants will live; the rest perish and leave vacant spaces of soil which eventually become occupied by foul grass, weeds, or moss, more or less to the detriment of the grass crop. Therefore, by neglecting to sow a sufficient number of varieties, we fail to obtain a full yield of grass, and what we do obtain is deteriorated by the mixture of weeds, the tendency of the latter being to increase and encroach upon the grass.

Mr. Flint says, "I hold this proposition to be indisputable; that any soil will yield a larger and more nutritious crop if sown with several kinds of nutritious grasses, than when sown with only one or two species. Indeed it is a fact well established, by careful experiment, that a mixture of only two or three species of grasses and clover will produce a less amount of hay than can be obtained by sowing a large number of species together. There may be some exceptions to this rule, as in the cases where the yield of timothy and red top, owing to the peculiar fitness of the soil for them, is as great as can stand on the ground where they grow."

Mr. Flint gives several lists of mixtures recommended for pastures and meadows, varying in number of varieties from nine to sixteen. In all natural and old pastures we find quite a number of varieties of grasses growing together in all cases. This is nature's plan for completely occupying the soil, and every farmer who observes carefully will be convinced that it is an essential point of success in grass-growing.

One more essential consideration in regard to success in growing grass. I will mention lastly, though not by any means of least importance, namely: the planting of trees, and the preservation of forests. Every pasture should have upon its borders and upon the highest points a sufficient number of trees for the comfort of stock, especially to protect them in the heat of the day from the scorching sun. Meadows may be bordered by trees, and a few scattering ones in the field will not be badly out of place. But these are minor considerations compared with the importance of growing and preserving trees for their ameliorating influence upon the climate. One of the most serious obstacles in the way of successful grass-growing is the long and scorching drouths to which our country seems to be more and more subject.

"The researches of modern science," says Professor Kedzie, of Michigan, "accurate and careful observation, as well as the history of the past, show that a country abounding in forest is more moist, has a more copious and equable rainfall, abounds more in springs and streams, and in consequence of all these, is more exempt from great and sudden fluctuations in temperature, from late frosts in spring and early frosts in fall. Thus, Egypt, from earliest periods of histo as been spoken of as a rainless region; but since Mahomet Ali has made his immense plantations of trees, showers have become frequent. The controlling influence of forests over rainfall, is also shown by the fact that countries once supplied with forests, and having abundant rains and immunity from frost, their forests being destroyed, have been scourged by drouth and frost till the forests were restored, when they once more became fruitful; or, if the inhabitants would not restore their protecting forests, the stern hand of famine threatened to wipe out a race that would not reverence the order of nature. Thus the Cape De Verde islands, so named from their greenness, have been stripped of their forests by their improvident inhabitants, since which time they suffer terribly from periodical drouths; sometimes no rain falling for three years at a time, and 30,000 inhabitants, or one-third of the population have perished. Thus famine cuts down the inhabitants as pitilessly as they cut down the protecting trees."

Abundant evidence can be found in our own country in proof of the favorable influence of forest upon the climate. There cannot be one present who has not vivid and painful recollections of long periods when the pastures were as heaps of dust, and when every living thing seemed in danger of famishing almost for want of a green thing to eat. It is safe to say, that in one hundred years from now, unless more attention is paid to tree planting and the preservation of forests, the farmers of this region will not be able to make a living from their lands.

SOME OF THE VARIETIES OF GRASS.

4th. The importance of studying the varieties of grasses has already been stated. It is a subject of too great magnitude to admit of being thoroughly presented at this time. A few prominent features only, in regard to the varieties and their uses, will be presented.

The importance of using a mixture of varieties in seeding to grass has been stated. We should also seek to stock our pastures, and especially our meadows, with the most nutritive grasses. To aid us in this respect, we have the experiments of Mr. Way, the chemist of the Royal Society of England, who has given us an analysis of twenty-one varieties of grass, and has thus disclosed to us, as well as chemistry can do, their relative values for feeding to animals. These experiments constitute, probably, the most valuable contribution which chemistry has ever made to agriculture. From these experiments we learn with surprise, that one hundred pounds of quaking grass will give 28½ pounds more of dry hay than one hundred pounds o vernal grass; that it will require 237 pounds of vernal grass to supply an animal with as much muscle-making matter as is afforded by one hundred pounds of Timothy. It will take 319 pounds of soft brome grass to lay as much fat on an animal as one hundred pounds of Timothy would do. One hundred pounds of Timothy will support the respiratory process as long, and afford as much animal heat, as 260 pounds of vernal grass. Chemistry teaches us, what every observing farmer knows, that Timothy is the most valuable grass that we have, especially for hay. It is much to be regretted that further experiments like those of Prof. Way have not been made, and also that the chemical results have not been thoroughly verified by actual experiments at the manger, conducted with care and precaution to guard against mistakes. Such investigations regarding the nutritive value of the different species of grasses would help to determine important questions relative to agricultural profits.

In the next place, we should select varieties for our meadows with reference to their period of ripening. It is often, if not generally important to have the meadows of a farm come successively to maturity, and with this end in view, we should sow such varieties together as flower at the same period. Hay is most nutritious and most palatable when cut at the period of flowering. I am aware that this is to some extent a disputed point. There are many farmers, especially in the West, who believe that Timothy should not be cut until it is ripe. They say that it gives more weight of hay when left until it is ripe, which is doubtless true, but that its value is thereby lessened there is scarcely room for doubt. Chemical analysis, and the practical trials of the best farmers in the oldest grass growing regions, concur in showing that the period of flowering is the best time to cut grass for hay, having reference to its nutritive value. At this time it contains more starch, sugar and albumen, which can be assimilated by animals, than at any other period; after this, these substances are converted into woody fiber and other compounds which cannot be favorably acted upon by the digestive organs, and are, therefore, wasted. If reference is had to the best authorities in this country or Europe, it will be found that they all agree in considering this an established principle. At the discussions held during the New England fair in September last, this subject came up, when very many of the farmers of New England, where grass is the leading crop, most emphatically urged the importance of cutting Timothy at the flowering period in order to secure its maximum value. Considering this point established, it follows that great loss must be sustained by cutting together those grasses which flower at different periods. If cut when the earlier grasses are in the proper condition, the later ones are watery and innutritious. If cut when the later grasses are in flower, the earlier have passed into woody fiber and other insoluble compounds. We see an example of this want of fitness in the practice, common all over the country, of sowing Timothy and red clover together, the clover being much the earliest.

If orchard grass and red clover are sown together, a much better crop for early mowing is obtained. Again, it follows, with farmers who have a large quantity of meadow, that if they are restricted to one or two varieties, great loss must be suffered for want of help sufficient to cut it all when in its best condition, the period of flowering; and every day that it stands after this diminishes the nutritive value. To prevent this waste, meadows may be so divided, and such varieties selected as to have part come to maturity in June, another part in July, and the remainder in August.

In regard to grasses for pasture, the case is quite different. The period of flowering of the different varieties in the pasture should differ as widely as possible. It is important to have those varieties which will afford the very earliest growth of herbage in the spring, and then to have a constant succession coming to perfection in every month from spring to fall.

I will not weary you with descriptions of varieties of grass, but will name a few which may be considered as adapted to the various purposes alluded to. In order to obtain a succession in meadows, on the principle pointed out, the following varieties may be taken for a beginning:

For early mowing, and for light sandy lands.—Orchard grass, red clover, annual spear grass, meadow foxtail.

For later mowing, and for clayey and calcareous loams.—Timothy, redtop, crested dog's tail, tall fescue, hard fescue, Italian rye grass, and oat grass.

For latest mowing, and for clayey lands.—Wire grass (*Poa compressa*), and foul meadow (*Poa scrotina*).

These different mowings will occur in the months of June, July, and August, later or earlier in the months, according to latitude.

For seeding lands for meadows or pastures, a few leading varieties may be mentioned as adapted to different soils.

For sandy soils.—Lucerne, though a legume, and not a true grass, is admirably adapted to sandy soils resting on porous subsoils; Meadow foxtail, orchard grass, Italian rye grass, hard fescue, tall oat grass, meadow soft grass, and the red and white clovers.

For calcareous loams—especially adapted—Kentucky blue grass, Timothy, and annual spear grass.

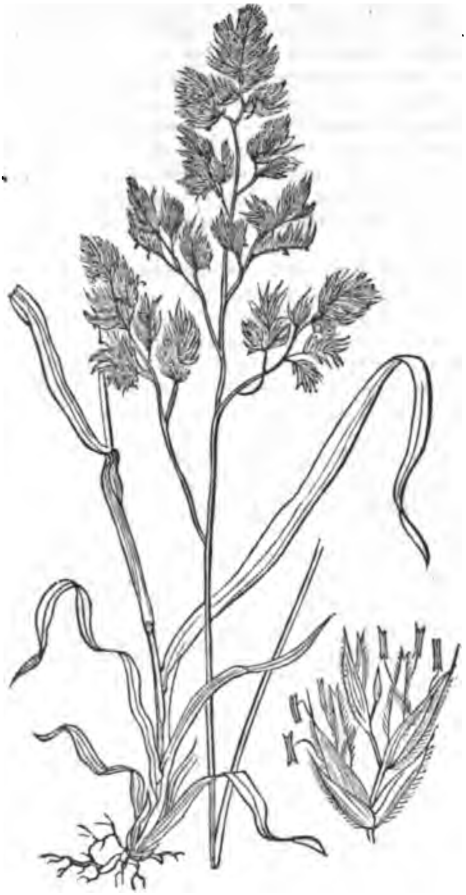
For tenacious clays.—Perennial rye grass, crested dog's tail, redtop, wiregrass (*Poa compressa*), and tall oat grass.

For permanent pastures, with a view to securing a succession in the time of blossoming, covering as much of the season as possible, Mr. Flint recommends the following mixture, giving the number of pounds of each for an acre:

Meadow Foxtail,	flowering	in May and June,	2 pounds.
Orchard Grass,	"	" "	6 "
Sweet-scented vernal,	"	in April and May,	1 "
Meadow fescue,	"	in May and June,	2 "
Redtop,	"	in June and July,	2 "
Kentucky blue grass,	"	in May and June,	4 "
Italian rye grass,	"	in June,	4 "
Perennial rye grass,	"	in June,	6 "
Timothy,	"	in June and July,	3 "
Rough stalked meadow,	"	" "	2 "
Perennial clover,	"	in June,	3 "
White clover,	"	from May to Sept.,	5 "
			—
			40 pounds.

This gives us forty pounds of seed for an acre, and twelve varieties; and would give, according to Mr. Flint, over 54,000,000 seeds! "In an acre," he says, "there are 6,272,640 inches, so that the mixture would give about eight seeds to the square inch." This he considers a very large and liberal seeding, allowing a large margin for worthless seeds, for imperfect sowing, and for destruction of plants by insects and frost.

In conclusion I must say that I have sincerely regretted having had at my command so little time—merely odd hours snatched from other duties—in which to prepare a subject of such primary importance to our agriculture, and in regard to which there is so much need of awakening more interest among Western farmers. If, however, I have presented facts and thoughts sufficient to induce any farmer to study the subject who has heretofore neglected to do so, he will probably supply himself without delay with such a work as Flint on Grasses, where he will find very much of what I have stated in this lecture, and a vast deal more, of the greatest importance for him to know. It has been wisely said, that he who makes two blades of grass grow where but one grew before, is a public benefactor. I have at least made an effort so accomplish something in that direction, and I hope that each of you will become public benefactors by contributing to double the amount of grass now produced.



ORCHARD GRASS.

Orchard Grass, Rough Cock's-foot.—(*Dactylis glomerata*), flowers in dense clusters. Its stem is erect, about three feet high; leaves linear, flat, dark green, rough on both surfaces, which, with the fancied resemblance of its clusters to the foot of a barnyard fowl, have given it the common name in England of rough cock's-foot. Root perennial. Flowers in June and July. Not uncommon in fields and pastures. This is one of the most valuable and widely known of all the pasture grasses. It is common to every country in Europe, to the north of Africa, and to Asia as well as to America. Its culture was introduced into England from Virginia, where it had been cultivated some years previously, in 1764. It forms one of the most common grasses of English natural pastures, on rich, deep, moist soils. It became, soon after its introduction into England, an object of special agricultural interest among cattle feeders, having been found to be exceedingly palatable to stock of all kinds. Its rapidity of growth, the luxuriance of its aftermath, and its power of enduring the cropping of cattle, commend it highly to the farmer's care, especially as a pasture grass.

As it blossoms earlier than Timothy, and about the time of red clover, it makes an admirable mixture with that plant, to cut in the blossom and cure for hay. As a pasture grass it should be fed close, both to prevent its forming thick tufts, and running to seed, when it loses a large proportion of its nutritive matter, and becomes hard and wiry. All kinds of stock eat it greedily when green.

Judge Buel said of it, "I should prefer it to almost every other grass, and cows are very fond of it." Elsewhere he says: "The American cock's-foot, or orchard grass, is one of the most abiding grasses we have. It is probably better adapted than any other grass to sow with clover and other seeds for permanent pasture or hay, as it is fit to cut with clover, and grows remarkably quick when cropped by cattle. Five or six day's growth in summer suffices to give a good bite. Its good properties consist in its early and rapid growth, and its resistance to drouth; but all agree that it should be closely cropped. Sheep will pass over every other grass to feed upon it. If suffered to grow long without being cropped, it becomes coarse and harsh. Colonel Powell (a late eminent farmer of Pennsylvania), after growing it ten years, declares that it produces more pasturage than any other grass he has seen in America. On being fed very close, it has produced good pasture after remaining five days at rest. It is suited to all arable soils. Two bushels of seed are requisite for an acre when sown alone, or half this quantity when sown with clover. The seed is very light, weighing not more than twelve or fourteen pounds to the bushel. It should be cut early for hay."

Mr. Saunders, a well known practical farmer and cattle breeder, of Kentucky, says of it: "My observation and experience have induced me to rely mainly on orchard grass and red clover; indeed, I now sow no other sort of grass seed. These grasses, mixed, make the best hay of all the grasses for this climate. It is nutritious, and well adapted as food for stock. Orchard grass is ready for grazing in the spring ten or twelve days sooner than any other that affords a full bite. When grazed down and the stock turned off, it will be ready for re-grazing in less than half the time required for Kentucky blue grass. It stands a severe drouth better than any other grass, keeping green and growing when other sorts are dried up. In summer it will grow more in a day than blue grass will in a week. Orchard grass is naturally disposed to form and grow in tussocks. The best prevention is a good preparation of the ground, and a sufficiency of seed uniformly sown. The late Judge Peters, of Pennsylvania—who was at the head of agricultural improvement in that State for many years—preferred it to all other grasses."

Orchard grass is less exhausting to the soil than rye grass or Timothy. It will endure considerable shade. In a porous subsoil its fibrous roots extend to a great depth. Its habit of growth unfits it for a lawn grass. Its seed weighs twelve pounds to the bushel, and to sow alone, about twenty-four pounds to the acre are required to make sure of a good crop. It should not be sown alone, except for the sake of raising the seed. It is worthy of a much extended cultivation among us.—*Flint on Grasses.*

MEADOW FOXTAIL.

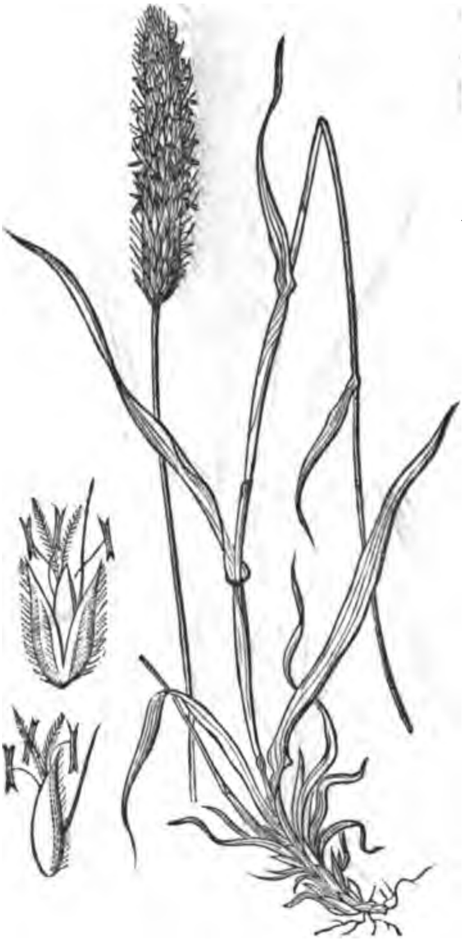
MEADOW FOXTAIL (*Alopecurus pratensis*), has an erect, smooth stem, two or three feet high, with swelling sheaths; spikes cylindrical, obtuse, equaling the sharp corn-like glumes; awn twisted, and twice the length of the blossom. The spike not so long as that of Timothy. Flowers in May, in fields and pastures. Perennial—introduced.

The meadow foxtail closely resembles Timothy, but may be distinguished from it as having one palea only. The spike or head of the meadow foxtail is soft, while that of Timothy is rough. It flowers earlier than Timothy, and thrives on all soils except the dryest sands and gravels. It is common, but is disliked by many farmers as a field grass, being very light in proportion to its bulk.

It is a valuable pasture grass, on account of its early and rapid growth, and of its being greatly relished by stock of all kinds. The stems and leaves are too few and light to make it so valuable as a field crop. It thrives best on a rich, moist, strong soil, and shoots up its flowering stalks so much earlier than Timothy, that it need not be mistaken for that grass, though at first sight it considerably resembles it. It is superior to Timothy as a permanent pasture grass, enduring the cropping of sheep and cattle better, and sending up a far more luxuriant aftermath.

It is justly regarded, therefore, as one of the most valuable of the native pasture grasses of England, forming there a very considerable portion of the sward, and enduring a great amount of forcing and irrigation. Though forming a close and permanent sod when fully set, it does not acquire its full perfection and hold of the soil until three or four years after being sown.

The nutritive qualities of meadow foxtail are most abundant at the time of flowering. It is said to lose upwards of seventy per cent. of its weight in drying, if cut in blossom.



MEADOW FOXTAIL.

The seed is covered with the soft and woolly husks of the flower, while the larger glume is furnished with an awn. There are five pounds of seed in a bushel, and 76,000 seeds in an ounce. An insect attacks the seed while it is forming, and it is also subject to blight; and hence good seed is somewhat difficult to procure, and is held at a high price.—*Flint.*

SWEET-SCENTED VERNAL GRASS.

Sweet-scented Vernal Grass (*Anthoxanthum odoratum*).—Spikelets spreading, three flowered; lateral flowers neutral, with one palea, hairy on the outside, and awned on the back; glumes thin, acute, keeled, the upper twice as long as the lower; seed ovate, adhering to the palea which incloses it; root perennial. Flowers in May and June. Stems from one and a half to two feet high. Introduced from Europe.

This is one of the earliest spring grasses, as well as one of the latest in the autumn, and is al-

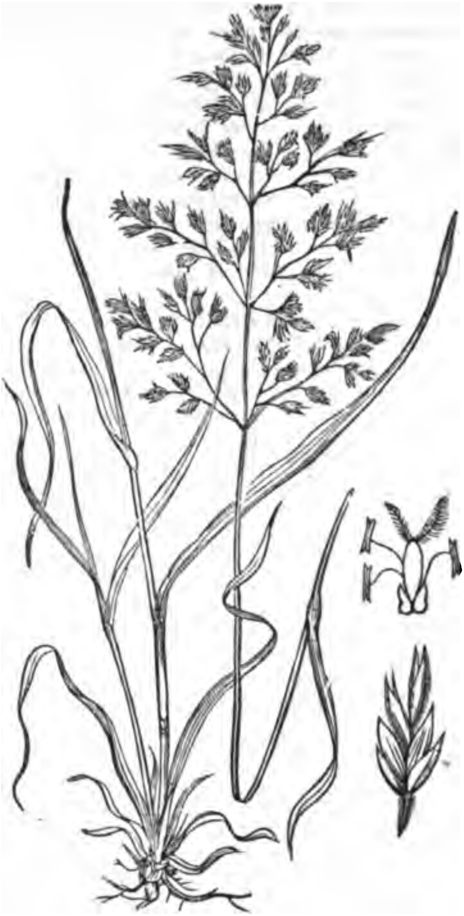
SWEET-SCENTED VERNAL GRASS.

most the only grass that is fragrant. It possesses a property said to be peculiar to this species, or possessed by only a few others, known as benzoic acid; and it is said to be this which not only gives it its own aromatic odor, but imparts it to other grasses with which it is cured. The green leaves, when bruised, give out this perfume to the fingers, and the plant may thus be known. It possesses but little value of itself, its nutritive properties being slight, nor is it much relished by stock of any kind; but as a pasture grass, with a large mixture of other species, it is valuable for its early growth.

It is not uncommon in our pastures and roadsides, growing as if it were indigenous.

The aftermath or fall growth of this beautiful grass is said to be richer in nutritive qualities than the growth of spring. Though it is pretty generally diffused over the country, it is only on certain soils that it takes complete possession of the surface, and forms the predominant grass in a permanent turf.

A curious and beautiful peculiarity is exhibited in the seeds of this grass, by which they are prevented from germinating in wet weather, after approaching maturity, and thus becoming abortive. The husks of the blossom adhering to the seed when ripe, and the jointed awn, by its spiral contortions, when affected by the alternate moisture and dryness of the atmosphere, act like levers to separate and lift it out from the calyx, even before the grass is bent or lodged, and while the spike is still erect. If the hand is moistened, and the seeds placed in it, they will appear to move like insects, from the uncoiling of the spiral twist of the awns attached to them. The seed weighs eight pounds to the bushel.—*Flint.*



KENTUCKY BLUE GRASS.

Green Meadow Grass, June Grass, Common Spear Grass, Kentucky Blue Grass, Etc. (*Poa pratensis*).—Lower florets connected at the base by a web of long, silky filaments, holding the calyx; outer palea five-ribbed, marginal ribs hairy; upper sheath longer than its leaf; height from ten to fifteen inches; root perennial, *creeping;* stem erect, smooth and round; leaves linear, flat, acute, roughish on the edges and inner surface; panicle diffuse, spreading, erect. The plant is of a light-green color, the spikelets frequently variagated with brownish purple. Introduced, and probably indigenous to some parts of the country. Flowers in June.

This is an early grass, very common in the soils of New England and the West, in pastures and fields, constituting a considerable portion of the turf. It varies very much in size and appearance, according to the soil on which it grows. In Kentucky it is universally known as Blue Grass, and elsewhere frequently as Kentucky Blue Grass, and still more frequently, in the Eastern States, as June Grass. It has been called by some, without much reason, the most valuable of all the grasses in our pastures. It comes into the soil in some parts of the country when left to itself, and grows luxuriantly and is relished by cattle. Its creeping root is said by some to impoverish the soil. Wherever it is intended for hay it is cut at the time of flowering, as, if the seed is allowed to ripen, more than a fourth part of the crop, according to some, is lost. In its earliness it is equalled by some of the other grasses, and in its nutritive constituents it is surpassed, according to the recent and reliable investigations of Prof. Way, by several other species. After being cut in summer it starts up slowly. Low says, "It is inferior to the rough-stalked meadow grass, and it may be questioned whether it deserves to be reckoned among the superior pasture grasses."

It produces but one flowering stem in a year, while many of the other grasses continue to shoot up flower-stalks and run to seed through the season. On this account it is recommended highly for lawns, where uniformity is desired. The produce ordinarily is small, compared with other grasses, but the herbage is fine. It grows well in rather a dry soil, but will grow on a variety of soils, from the dryest knolls to a wet meadow, but does not withstand our severe droughts as well as some other grasses. Its reputation is higher in this country than in England, where it is denied, by many farmers, even a place among the grasses to be recommended for cultivation. It endures the frosts of winter better than many other grasses; and in Kentucky, where it attains the highest perfection as a pasture grass, it sometimes continues luxuriant through their mild winters.

June grass requires at least two or three years to become well set, and it does not arrive at its perfection as a pasture grass till the sward is older than that; and hence it is not suited to alternate husbandry, or where the land is to remain in grass only two or three years, and then be ploughed up.

In Kentucky, tho best blue grass is found in partially shaded pastures. A well-known farmer of that State, in a communication to the *Ohio Farmer*, says: "In our climate and soil, it is not only the most beautiful of grasses, but the most valuable of crops. It is the first deciduous plant which puts forth its leaves here; ripens its seed about the tenth of June, and then remains green, if the summer is favorable in moisture, during the summer months, growing slowly till about the last of August, when it takes a second vigorous growth, until the ground is frozen by winter's cold. If the summer is dry, it drys up utterly, and will burn if set on fire; but even then, if the spring growth has been left upon the ground, is very nutritious to all grazing stock, and especially to sheep and cattle, and all ruminating animals. When left to have all its fall growth, it makes fine winter pasture for all kinds of grazing animals. Cattle will not seek it through the snow, but sheep, mules, and horses, will paw off the snow and get plenty without any other food. When covered with snow, cattle require some other feeding; otherwise they do well all winter upon it.

"It makes also the best of hay. I have used it for that for twenty years. It should be cut just as the seeds *begin* to ripen, be well spread, and protected from the dew at night by windrowing or cocking; the second evening stacked, with salt, or sheltered with salt also. When properly cured, stock seem greatly to prefer it to all other hay. I would not recommend it for meadow, especially, however, because the yield is hardly equal to Timothy and clover, and because it is more difficult to cut and cure."

The same writer says: "Any time in the winter, when the snow is on the ground, sow broadcast from three to four quarts of clean seed to the acre. With the spring the seeds germinate, and are very fine in the sprouts, and delicate. No stock should be allowed for the first year, nor until the grass seeds in June, for the first time in the second year. The best plan is to turn on your stock when the seed ripens in June. Graze off the grass, then allow the fall growth and graze all winter, taking care never to feed the grass closely at any time."

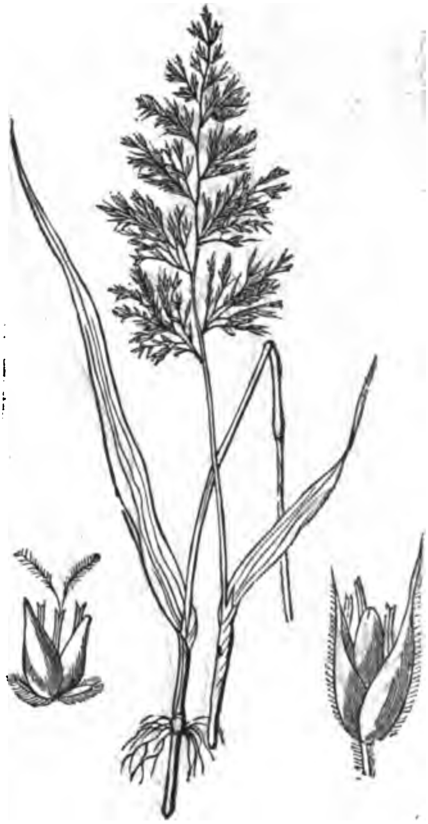
Another eminent cattle breeder, speaking of this grass, says, "Whoever has limestone land has blue grass; whoever has blue grass has the basis of all agricultural prosperity; and that man, if he have not the finest horses, cattle, and sheep, has no one to blame but himself. Others in other circumstances, may do well. He can hardly avoid doing well, if he will try."—*Flint.*

REED CANARY GRASS.

Reed Canary Grass (*Phaloris arundinacea*) has a panicle very slightly branched, clustered somewhat spreading when old, glumes wingless, rudimentary florets hairy; stem round, smooth, erect, from two to seven feet high; leaves five or six in number, broad lightish-green, acute, harsh, flat-ribbed, central rib the most prominent, roughish on both surfaces, edges minutely toothed; smooth, striated sheaths. Flowers in July. It grows on wet grounds by the sides of rivers and standing pools. There are about five hundred thousand grains or seeds of this grass to the pound. It may be gathered and sown with winter grain, to be ploughed in as a green manuring.

A beautiful variety of this species is the Ribbon or Striped Grass of the gardens, familiar to every one, The reed canary grass will bear cutting two or three times in a season, but if not cut early, the foliage is coarse. Cattle are not very fond of it at any stage of its growth; but if cut early and well cured, they will eat it in the winter, if they can get nothing better.

This grass is not unfrequently produced by transplanting the roots of the striped grass into suitable soils. In one instance, within my knowledge, it came in and produced an exceedingly heavy crop, simply from roots of ribbon grass, which had been dug up from a garden and thrown

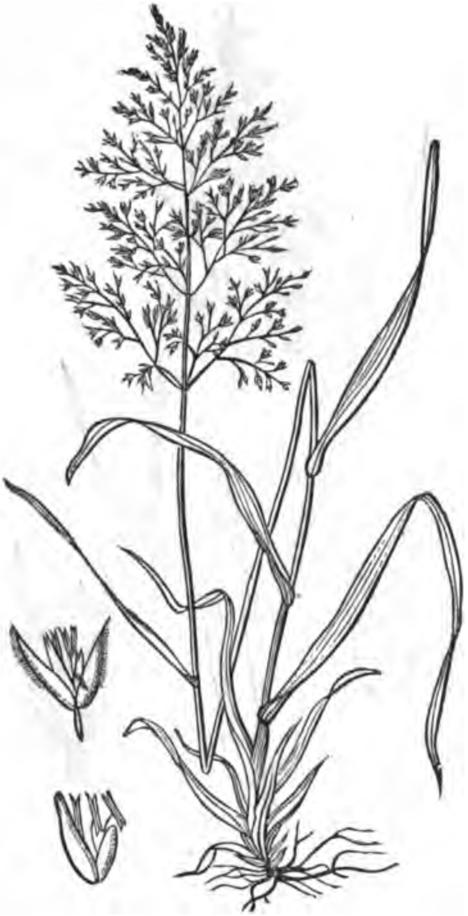


REED CANARY GRASS.

into a brook, to get them out of the way. Several other instances of a similar nature have also come to my notice. One farmer has propagated it extensively in his wet meadows by forcing the ripe seed-panicles into the mud with his feet. As the stripe of the ribbon grass is only accidental, dependent on location and soil, it constitutes only a variety of the reed canary grass, and loses the stripe when transferred to a wet and muddy soil.

To ascertain the exact nutritive qualities of this grass when cured as hay, a careful analysis has been made, at my request, by Prof. E. N. Horsford, of Cambridge, with the following result: Of water, the specimen contained 10.42 per cent.; ash, 5.31 per cent.; nitrogen, .55 per cent.; nitrogenous ingredients, flesh-forming principles, 3.53 per cent.; woody fibre, starch, gum, sugar, etc., 80.73 per cent. It will be seen, by reference to a subsequent page, containing analyses, by Prof. Way, that this grass is very far inferior to many other grasses examined by him. The panicles of this grass, if allowed to stand after the time of flowering, become filled with ergot, or long, black spurs, issuing from between the glumes, and occupying the place of grain. This, if there were no other reason, would be sufficient to determine that it should be cut at or before the time of flowering. I have never seen rye worse affected than my specimens of this grass are. The effects of this mysterious disease are well known. The noxious power it exerts on the system of animals, which receive even a small portion of it, is oftentimes dreadful, producing "most horrible gangrene, rotting of the extremities, internal tortures, and agonizing death. It has been known to slough and kill not a few human beings, who have accidentally or inadvertently eaten grain or flour infected with it."

The variety called striped grass (*Colorata*) is exceedingly hardy, and may be propagated to any extent by dividing and transplanting the roots. In moist soils it spreads rapidly, and forms a thick mass of fodder, which might be repeatedly cut without injury, though it is of little value for feeding stock.—*Flint.*



REDTOP.

Redtop, Finetop, Burden's Grass, Herd's Grass of Pennsylvania and the Southern States (*Agrostis vulgaris*).—Stems erect, slender, round, smooth and polished; roots creeping, panicle oblong, leaves linear, ligule very short; lower palea mostly awnless, and three-nerved. Flowers in July. In pastures and meadows very common—introduced. The term *agrostis* was the ancient Greek word for field, and was applied to all varieties of grass that grew there.

This valuable grass, so common in all our cultivated fields, has been an inhabitant of our soils for more than a century. It was called English grass by Eliot, Deane and other early writers, and by the English, Fine Bent. Most of the grasses of this genus are known in England under the name of "Bent Grass," of which there are many species.

Redtop is often sown with Timothy and common red clover, in which case the clover of course soon disappears, when Timothy follows, after which redtop usually takes its place, and, with some wild grasses, forms a close sward. In Pennsylvania, and States further South, it is universally known as Herd's Grass—a name applied in New England and New York to Timothy (*Phleum pratense*) alone. It is of somewhat slow growth, but of good medium quality, suited to most soils, though common to all.

This grass is probably overrated by us. It makes a profitable crop for spending, though not so large as that obtained from Timothy. It is a good permanent grass, standing our climate as well as any other, and consequently well suited to our pastures, in which it should be fed close; for, if allowed to grow up to seed, the cattle refuse it; and this seems to show that it is not so much relished by stock as some of the other pasture grasses. The fact that cattle eat any grass greedily in the spring, is no proof of its excellence or nutritious qualities; since then all grasses are tender and full of juice, and many varieties of both grasses and shrubs are readily eaten, which, at a more advanced stage of growth, are refused. * *

This grass is known by various names, and is greatly modified by soil and cultivation. On a moist, rich soil it grows larger than on poor, thin soil; and not only larger, but has a darker, purplish color, with a stem varying from eighteen inches to two or two and a half feet high; while on thin, poor, gravelly soils, it seldom grows over twelve inches, and often not over six inches high, while it has a lighter color. In the latter situation it goes by the name of Finetop, and is universally seen in old, dry pastures.—*Flint.*

John Stanton Gould, of New York, who has made the subject of grasses an especial study, says that redtop is one of our most valuable grasses, especially for feeding working oxen. It is well adapted to tenacious clay soils, loves moist places, and will thrive on wet land better than most varieties. In regard to other varieties that are called redtop, Mr. Gould writes the following:

There are, in fact, many very different varieties of grass which are called by that name (redtop) in different sections of the country. *Tricuspis sesleroides* is called redtop, or tall redtop, in various sections of the country; in the mountain regions of Pennsylvania they know no other grass by that name. In some sections of the country the name is applied to *Cinna arundinacea;* in others to *Glyceria aquatica;* in others to *G. nervata.* All over the country *Agrostis canina* is mixed in with *A. vulgaris,* and farmers do not know the difference. It may be readily distinguished by its bearing an awn on the back of the lower palea inserted a little below the middle, which is at length somewhat bent. *T. sesleroides* may be distinguished by three cups on the upper part of the palea, caused by an extension of the ribs beyond the margin, whereas the palea of *A. vulgaris* is without nerves or ribs. *G. aquatica* by its much branched, open panicle, and by the strongly marked nerves on the palea. *G. nerveta* is distinguished by its fewer flowering branches, its more pyramidal panicle, and its more prominent nerves. Besides these we have *Calamagrostis Canadensis* called redtop in some places. It is known in other places as Blue joint, and may be always distinguished by a tuft of hairs at the base of the paleæ. From these specimens you see that a great variety of plants differing widely in agricultural value and adaptations are included under the general name of redtop; and that statements made by one man about redtop would seriously mislead another who was accustomed to call a widely different grass by that name. The moral of all this is, let farmers learn to distinguish grasses by the true botanical names, and they will neither be misled themselves nor mislead others.

WHEAT.

A lecture by Hon. W. C. Flagg, of Alton, Illinois, delivered at the Illinois Industrial University, January 14, 1868.

The semi-tropical summer of the Mississippi Valley points to corn as the most natural and valuable grain that can be grown within our borders. But wheat from its easy culture, its ready sale and its universal and acceptable use, even upon soils and under skies not at all propitious to its growth is second only in importance. We even find wheat grown where corn is the more profitable crop; something which I can only account for on the supposition that the quick returns of the wheat crop are an irresistible temptation to the thriftless farmer.

In Southern Illinois, I find upon fair calculation that the cost and value of an acre of good corn and wheat, are about as follows:

	Corn.	Wheat.
Plowing	$1 50	$2 00
Harrowing	20	20
Laying off	20	......
Planting	25	20
Seed	25	2 50
Tending	80	......
Gathering	2 50	......
Cutting	......	1 00
Binding	....	1 25
Stacking	......	1 10
Shelling	2 40	......
Threshing	......	2 40
Hauling	1 80	60
Total	$9 90	$11 25
Product estimated	60 bushels.	20 bushels.
Price	75 cts.	$2 00
Gross value per acre	$45 00	$40 00
Net value per acre	$35 10	$28 75

This makes an excess of $6 35 per acre in favor of corn, supposing it is shelled and sold in the market. Fed on the farm, it could of course, be made much more profitable. In that case, profits from feeding could be added and the manure of the stock to which it was fed would go to enrich the land and prevent the exhaustion of the soil.

In face of such facts as the above, I believe, that in certain counties of our State, wheat growing has steadily increased, while corn, barely holds its own. In Jersey, St. Clair, Monroe, Randolph and Clinton counties, lying near St. Louis, the acreage of wheat according to the Auditor's report just rendered, exceeds that of corn. In Monroe county, three acres of wheat are grown to one of corn. St. Clair, has nearly two acres of wheat to one of corn, and Jersey about three to two. Other counties are following in their wake, and even in Boone and McHenry, on the north line of the State, give more spring wheat than corn. No cattle worth mentioning are kept on these wheat farms. The straw is burned in the field and the only return, if we may call it such, made to the soil is generally a clover crop turned under, and in a few instances, a scanty manuring from the stables of the horses kept to plough the land. In some cases no corn is grown on the farm, but is purchased with the proceeds of the wheat crops.

The wheat grower therefore must look about him, and seek better methods, or he will rightfully be accused of bad economy. He may hardly be able to show that even with the best management he can make wheat replace corn in profit, in the State of Illinois; but as part of a rotation,—as one of a succession of crops to fill the year with labor and harvests, he may be able to show that it has a fitting place and a profitable use; whilst its excellence as a bread stuff renders it almost indispensable.

Premising thus much by way of protest against the terrible waste of agricultural wealth now going on all over the West, by growing and exporting this valuable grain, and robbing posterity without real benefit to even our own generation. I will undertake to say, in the want of a fit person, a few words on wheat growing.

In Illinois, according to the State Auditor's last report, we had in 1867, 2,083,189 acres in wheat against 4,725,386 acres in corn. Of this two millions of acres, probably somewhere about half, was winter wheat mostly grown in the Southern part of the State, and the other part spring wheat, generally grown in the Northern portion. The spring wheat seems best suited to the cooler springs of the Northern portion, although I have known instances of thirty bushels to the acre as far south as Alton. The winter wheat owing to the snowless winters on our plains and the looser character of the black soils is more easily winter killed in the Central and Northern part of the State, and is limited to the white soils of Southern Illinois for its most fitting place and successful growth.

The best soil for winter wheat, so far as I have observed, are the white oak ridges along the Mississippi bluff. The crop is there quite certain and the quality of the grain and the flour made of it quite superior. The poorest soils for wheat are the wet and rich prairie lands of the creek and river bottoms. I suppose the wheat of Jersey, Madison, St. Clair, Monroe and Randolph counties, is about the best in the State; and is, no doubt, one reason of the crop having been so excessively grown in that part of the State. The hot climate of the Southern part of the State, while I think it reduces the average yield per acre, probably has an effect similar to that of Southern Europe in producing a harder wheat, containing more gluten and producing a finer quality of flour.

The best rotation of crops in which wheat makes a part of the course, is, I think, the following, commencing with corn on sward:

1st year,	corn.
2d year,	corn.
3d year,	oats, barley or other spring crops.
4th year,	wheat.
5th to 7th year,	grass, as meadow.
8th to 10th year,	grass, as pasture.

Thus for every year we have for every acre of wheat two of corn, one of oats, or other spring crop, three of meadow, and three of pasture. I am not prepared to say that this is the best possible rotation, but I think it is a good one, especially in its proportions of grass and grain.

Wheat, therefore, succeeds oats or other spring crop. It is a good succession to clover plowed under, and probably also to ordinary sward when pretty well rotted; but as a matter of convenience I prefer the above rotation, and let the stronger and ranker condition of green or other manures spend its first force on corn, while the wheat draws more from the better decomposed material and the original elements of the soil.

The stubble of oats should be turned under as soon as possible after cutting, in our climate, to a greater or less depth, which should vary according to the fertility of the soil, and the weight of stubble. The poorer the soil the deeper it should be broken up. The practice varies, between breaking up once in this manner and running a cultivator or harrow over the surface occasionally to keep down weeds until sowing time, and ploughing a second time just before seeding. All agree, however, in saying that the ground should be finely pulverized first, and then well packed together by rolling, or some other treatment, so that when the drill is brought into requisition, it may find a hard, firm, fine soil to receive its flukes.

I say the drill because all our experience in Southern Illinois, so far as I know, is strongly in favor of drilling in preference to sowing wheat. The drill saves seed, deposits it at pretty uniform depth, and leaves the plant sheltered in a shallow furrow by the adjacent ridges, whence the disintegration of winter's frost and thaws covers the roots instead of laying them bare. In the Michigan woods, where snow lies throughout the winter, I find drills in less universal favor.

Why wheat succeeds best when drilled in a hard soil, is, I take it, from the fact that such a soil heaves less readily, and does not admit frost to the roots so easily. This probably is one reason also of the superior success of winter wheat in the silty soils of Southern Illinois. The soil is there finely comminuted and comparatively free from vegetable matter, whilst here it is coarser, more friable and loose.

Owing to the ravages of the fly farmers with us are now practicing later sowing than formerly. In avoiding this evil, however, it is a question whether we do not fall upon a greater. This late sowing necessitates the sowing of early ripening varieties, which are not the most productive, endangers the plant in winter from insufficient rooting, and delays ripening in summer, with consequent danger from heat and rust. The past season extreme heat by its direct action very materially lessened the yield per acre in our part of the State. But the rust is the disease most dreaded by our cultivators. This may be regarded as the result of extremes of heat and cold, drought and moisture, whereby the vitality of the plant is lowered, and its tissues ruptured, and made the prey of fungoid growths.

The culture of wheat has been rarely attempted in this country, although Jethro Tull and his Horse Hoe Husbandry were introduced by William Cobbett to American farmers over half a century ago. One gentleman who is present with us to-day, and who will, I hope, give his experience in the discussion, has told me that he fears spring cultivation because it increases the plant growth and delays too much the period of ripening, and endangers rust. Others, however, claim that harrowing in spring has been attended with a great increase of crop; and the drill itself suggests a use of that or a similar instrument to cultivate the ground between the rows of wheat.

This danger of late ripening, resulting from late sowing and spring cultivation, suggests renewed attention to the subject of early sowing. It ought, if possible, to be effected; and I trust Dr. Walsh and his co-laborers may sometime help us to it. Failing in that we need to know more of those fungoid growths attending rust, potato rot, and the many diseases so fatal to the farmer and fruit grower. Here we feel the necessity of a State Botanist, and Botanical Survey, which shall, among other things, develop and make understood the various rots, rusts and mildews resulting from the changes of our variable climate.

The time of cutting wheat is a point upon which I have little personal knowledge, but which is a matter of great importance. It is a very common opinion that early cutting produces a plumper grain, a larger product, and a better flour. This opinion, however, is probably not correct, or at least only in part. During the past very hot and dry harvest, early cutting was one case that came under my observation attended by absolute injury.

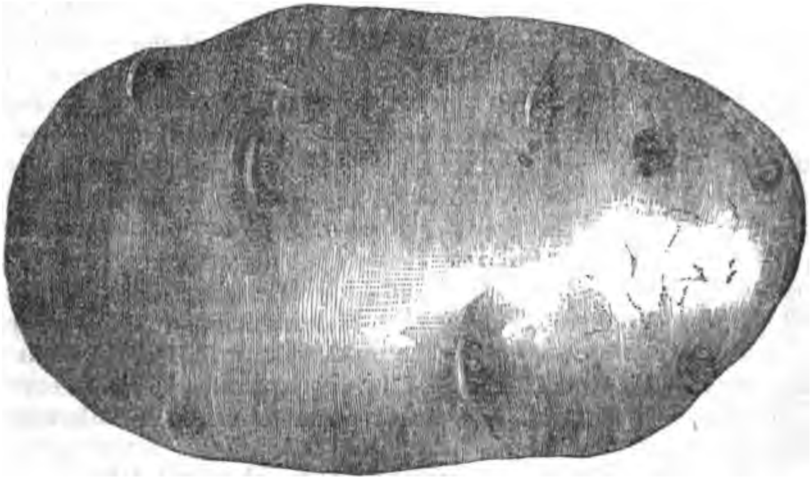
The methods of cutting, within the memory of many who hear me, have wonderfully changed and improved. First came the sickle. Not much before 1830 the grain cradle came into use in our State, ten or fifteen years later came the reapers and harvesters, the clash of whose shuttle-moving sickle bars are now heard upon all our broad prairies. These, like the "might night" of Euripides brought comparative "repose to over-burdened men," but gave a new and probably excessive impulse to the growing of small grains.

Of reapers I have used only Hussy's, a heavy implement only endurable when we had no better, and John H. Manny's, which I liked well. But I learn from others that Marsh's harvester and reaper, which carrys two men upon it, who do the binding, is in many places doing excellently well. There are, however, a large class of reapers, all doing good work, and varying only in unimportant details, among which there is little choice.

Harvesters or Headers, so far as I have observed, I have no experience, are generally objectionable. First, because of the risk of waiting until the grain is dead ripe, resulting often in great loss from storms, and the "shattering" of the grain and, secondly, from the difficulty of properly stacking and saving the grain in the present want of proper buildings.

The best method of taking care of the grain before threshing, unless threshing is done in the field—and this is a very wasteful process—is in my opinion putting it into open barns, thus securing good ventilation, and avoiding the common evil of waste from bad stacking and heavy rains. In England, with a very humid atmosphere, and no violent rains, stacking is preferred as keeping the grain in better condition, and stacking and thatching of stacks is there done with great thoroughness. In our usually dry climate wheat can remain in barns uninjured, whilst occasional violent rains will penetrate almost any stack. By housing wheat early, moreover, we get a clean straw, which can be very advantageously used in farm economy, as feed litter, etc.

Threshing grain is the least satisfactory of our improved processes. The old days of the flail, and tramping out with horses, are almost preferable to the present state of things. Threshing the present year in seven places in my neighborhood has cost from 18 to 25 cents per bushel or from one-third to one half of the entire cost of production, which is 50 to 60 cents per bushel. A man with a flail could do as well as that, and probably more cheaply and better.



EARLY ROSE.

POTATOES.

A lecture delivered by Jonathan Periam, Superintendent Practical Agriculture, Illinois Industrial University, delivered January 15th, 1868.

The Potato, miscalled Irish, and botanically known by the name of *Solanum tuberosum*, or Tuberous-rooted Nightshade, is said to be found growing indigenous from Carolina, in the United States, to Peru in South America. It belongs to the vegetable order *Solanacea*. Among the edibles in this order of plants, are the Tomato, Potato, Egg Plant, Pepper, the Ground Cherry, and that plant, of doubtful utility, Tobacco. As a food producing plant among civilized nations, the potato ranks second in importance; has added millions to the human race, and has averted those famines which formerly swept over Europe, occasioned from a partial or total failure of the grain crops. An entire destruction of the potato crop, as was some years feared, would bring gaunt famine and death among the poor throughout the civilized world. It may be well, therefore, to consider the history and diseases of this esculent, containing, as it does, so many elements conducive to human health, whose increased or diminished productiveness carries with it so much of weal or woe to the human family.

The natural history of the potato leaves us in some doubt as to its original nativity. It was carried to England, in 1565, by Sir John Wamkins, from Santa Fe de Begota, where it is found growing wild, at an elevation of from 8,000 to 13,000 feet above the ocean, in elevated valleys surrounded by high mountains, and above the range of Indian corn. The climate is dry and cool, and being near the equator is not subject to great extremes of heat and cold. An attention to this fact will be of advantage to cultivators of this crop, in climates not so well suited to it. It is said to have been known, at that early day, in various parts of North America, and after its introduction into England, from Virginia, by Sir Walter Raleigh, in 1586, it began to attract more and more notice, until, at this day, the potato, as one of the root crops, and maize among cereals, have been among the most valuable food producing plants ever bestowed upon man. From a history of the potato, by Bonjean, published in 1836, and translated by Henry Meigs, we find the following: That it came, originally, from the intertropical parts of the American continent; that it grows spontaneously from Carolina to Valparaiso, in Chili.

The celebrated Joseph Pavon, one of the authors of the Peruvian Flora, found it growing wild in the vicinity of Lima, Peru, where the Indians cultivated it abundantly for their subsistence. Lopez de Tomera, a Spanish priest, in his general history of the Indies, published in 1553, mentions the *Papas*, the name by which it was known to the Indians. Joseph Acosta says that the Peruvians employed it in lieu of bread roots, which they called *Chunno*, or they ate them fresh and boiled.

Before its introduction into England, it had already been very extensively diffused throughout the south of Europe. The botanist, Charles L'Ecluses (Clusius), about the year 1588, is said to have been the first European writer who mentions the potato. In 1631 he published a description of the root, and says that it was then so common in some parts of Italy that it was eaten by men and fed to hogs. He doubts whether it was known to ancients; thinks that it may have been the *Arachidna* of Theophrastus. Cortusus, another botanist, supposes that it was the *Pycnocoma* of Dioscorides. In 1590, Gaspard Bonhin received from Scholtz a colored drawing of the potato, and recognized it as a Solanum. Mathiola afterwards described it in his commentaries upon Dioscorides.

It was in Italy that potatoes were first cultivated to any extent, and from thence it began to be spread over Europe, about the year 1550. The Italians called them Tartoffoli, or ground huffles, and from this is said to have come the German name Kartoffle. Parmentier, in 1783, succeeded in introducing the potato into general cultivation in France, and spent much time and research in demonstrating, by chemical experiments, that the potato was both a healthful and nutritious food. The following is a summing up of an analysis of the potato, by the author first quoted, Bonjean:

Starch, peculiar animal matter, bitter aromatic resin, Parenchyma (fibrous matter), Solanin, Asparagine, colored Albumen, a sugar principle, a gum principle, citrate of lime, citrate of potash, phosphate of potash, phosphate of lime, free citric acid, Silica, Alumine, Magnesia, Manganese, oxide of iron, Iode, Brome and water of vegetation.

An analysis of the Mercer potato, conducted by Chas. T. Jackson, M. D., of Boston, Mass., gives in 100 parts, by weight:

Water	75.80	per cent.
Starch	12.54	"
Cellulose	3.62	"
Other matters, not separated	8.04	"
	100.00	

In an analysis of the ash of the potato, according to Professor Norton, it contains:

Carbonic acid	10.04	per cent.
Sulphuric acid	7.01	"
Phosphoric acid	11.03	"
Chlorine	2.07	"
Lime	1.08	"
Magnesia	5.04	"
Potash	51.05	"
Soda	trace.	
Silicia	8.06	"
Iron	0.05	"
Charcoal in ash, and loss	0.07	"
	100.00	

After its introduction into England, by Sir Walter Raleigh, it was cultivated in Ireland in 1610, in Alsace in 1720, in Scotland in 1728, in Switzerland in 1730. Since this time its cultivation has been extended to every civilized country and many barbarous ones, from the equator to the 64th parallel of north latitude, has added millions to the population of the earth, and has rendered almost unknown those famines which so often desolated the civilized world. Indeed, it has been said that if the sanguinary wars of the French revolution had occurred before the introduction of the potato, that Europe would have been decimated by famine.

How thankful then ought we to be, even in this day of degenerate potatoes, that they are left us at all, and how well spent would be the life of that man who could restore to us the potato in its original vigor and productiveness.

Very many theories have been, from time to time, promulgated relating to the deterioration of the potato, principal among which are degeneration, or a wearing out of its vital forces, which nature herself has disproved, by recuperating, in a measure, this valuable esculent.

Another theory is that the disease is produced by excessive cultivation and high manuring, thereby inducing an extremely succulent and watery growth, and consequently a greater liability to be affected by atmospheric and other changes, which are consequently taking place. That it is due to this cause, measurably, is patent to my mind, from the fact that the potato, when given its normal condition, i. e. a cool and equable temperature, allowing it to make its growth without subjecting it to violent atmospheric changes, it uniformly produces fair crops, as for instance: if we plant early York, Sebeg or Goodrich in this latitude, in March, upon new or fibrous soil, however well manured, we may confidently expect to harvest a good crop about the first of August; and also if we plant in June, we may expect to gather a crop in September or October, if the season is proper, that is, not wet and hot. These are conditions that are not suitable to a healthful growth of the potato. In fact, a season that produces good wheat is apt to produce good potatoes, but a season that is subjected to violent extremes of heat and cold, especially upon highly manured soils, is sure to deteriorate and reduce the potato crop.

The present season, for instance, was noted for an excessively hot and dry June and July; now, if these months had been alternated with wet and cold, as well as heat, it would have followed that the potato crop, both early and late, would have been totally destroyed, but the early crop having covered the ground with their vines before the extreme drouth set in, they were enabled to mature a fair crop. Those planted later succumbed to the drouth, while those planted late in June grew slowly until the fall rains set in, and then perfected a reasonable crop.

Now, the effect of high cultivation, and strong and especially green manures, is such as to induce an extremely succulent growth of vines, and while in this condition, if such weather occurs as would cause rust in the wheat plant or rot in fruit, the cells being gorged with sap, are ruptured, and decomposition taking place, it is immediately seized upon by microscopic fungi, and unless seasonable weather succeed, the poisonous matter is communicated to every part of the plant, and a total destruction of the plant ensues. That it is due to atmospheric causes, in a great measure, there is no doubt, and it is also as true that a hot murky atmosphere is the superinducing cause.

Indeed, the disease has not been confined exclusively to the potato, for, about the same time, we have accounts of similarly affected bulbs and roots, as tulips, hyacinths, the sweet potato, various vegetables and fruits, as tomatoes, the yam, the cocoa, apples, peaches, pears and other fruits. That it is due to engorgement or something analagous, I believe, the rupture of the plant cells, presenting a proper nidus for microscopic insects and fungi, the vitality of the plant is more and more impaired, until finally, as in the case of annuals, they are completely destroyed; but perennials may linger from year to year until they finally succumb, or, during more favorable seasons, eventually recover. This is a principal reason that we find certain plants growing within certain isothermal lines, or where the temperature is natural to them, and it is not strange that the potato, requiring as it does such peculiar conditions for its normal · development, being transplanted to such a variety of climates, should become diseased, and the seeds of that disease be carried, perhaps, to every country where it is cultivated. It is to be hoped that the examinations now being made, relating to microscopic fungi, under the auspices of our State Horticultural Society, and also by scientific individuals, may ultimately lead us to the point from which we may more satisfactorily account not only for this, but other mysteries connected with plan life.

Under the influence of heat, organized bodies expand. So do some at least, under the action of cold, taking 32° Farenheit as the initial point; under the influence of electricity, however, some are resolved into their component parts; under the action of heat and moisture, the circulation of plants becomes active, and under that of light, plants, through their leaves and otherwise, form their organized structures, from organic and inorganic materials. All material substances exist, either as solid, liquid, or gaseous. Chemistry teaches us that all substances consist of atoms. We know how inappreciable the spores of microscopic fungi are, that under a power of 500 diameters, some are so infinitely minute, that they are scarcely perceptible, and yet they are *composed of atoms*, a single one of millions. Perhaps there exist animalcula, so small that it would take many millions aggregated together, to become visible to the natural eye of man, now since atoms, massed from everything with which we are acquainted, their arrangement implies contact, and who shall say, that the attraction and repulsion of these atomic bodies, may not produce disorganization, decay and death.

Atoms however, remain unaltered. They are unchangeable and indestructible. But organized substances are destroyed or changed, according to the arrangement of their component atoms, and herein, a field for the chemist lies. In determining the true condition of matter in the healthful plant, and the variable modifications produced by abnormal agencies, not in the abstract, but as by means of external and internal influence, as for instance, in what manner the normal condition of plants are changed by various agents, since all matter is made up of proximate atoms. So do the various combinations of atoms produce and reproduce everything visible and invisible. The air we breathe, the forest, the microscopic animalcula, or the prize ox swelling with fatness, and so does an abnormal arrangement of these atoms produce disease, decay and death; not by degeneration, but from disorganization. And the student in vegetable physiology, who solves the problem relating to the derangement of vegetable organisms, and the means of prevention, even proximately, will deserve as well of his fellows, as the savior of a nation. In the meantime, we must use such means as we already can compass.

I have already stated that the potato required a cool equable climate. Michigan and Wisconsin are celebrated for their fine crops of potatoes, so are Maine and Nova Scotia. Now it is known, that the climate of Michigan, nearly surrounded as it is by extremely deep water, and protected beside by dense forests, has a comparatively equal climate, it is warmer in winter and cooler in summer, not subject to so violent alternations of heat and cold, as are the more open countries in the same latitude lying west of Lake Michigan. In fact the delicate Carter potato is successfully grown on the eastern shore of Lake Michigan, 200 miles north of Chicago, upon the clearings of the dense forests, for the reason, that their summers although short, are marked by a steady degree of heat and moisture, sufficient to mature the crop; so of Maine and Nova Scotia.

Wisconsin is subject to greater atmospheric variations, lies nearer the great treeless prairies, but is at the same time, sufficiently protected to be exempt from the more violent extremes.

Indian Corn, requires a much greater average heat to mature its crop than the potato, but at the same time, it will stand greater extremes of heat and cold. The least frost blackens the potato vine, but the corn simply turns yellow, subsequently recovers, and under favorable conditions as to moisture and heat, matures its crop.

Let us look for a moment at the theory of degeneration as producing the potato rot. It is essentially this, that reproduction, by extension as by layering, by cuttings and by eyes, tends to so impoverish the vital energy of the plant, from generation to generation, that it continually becomes more and more weakened, until finally it dies. Now, plants as well as animals, may be called both viviporous and oviporous, not scientifically, but, if I may be allowed the word, as a condensed illustration, and some plants, as the potato, dahlia, artichoke, etc., are both oviporous and viviporous. Oviporous as reproducing themselves from seeds or ovules, and viviporous, reproducing themselves by tubers, or offsets or buds. Now, the seed, in order to reproduce the living organism, must first undergo certain changes, must be placed in its nest and be hatched, but in reproduction from the bud, it is fed by the sap itself until it has put forth its roots and leaves and is enabled to draw from the earth its proper nourishment. It seems to be a law of nature that the more we refine either the animal or plant, the more susceptible it becomes to climatic and other changes; that the more we refine, the more delicate becomes the tissue; that the higher we feed, the more liable are we to engorge, and with engorgement comes rupture, disease and death. We have forced the potato, by high feeding and extreme culture, into excessive growth. Under certain atmospheric or other conditions engorgement ensues, the cellular tissue is ruptured, the vitiated sap decomposes, fungi attacks it, and unless assisted by other conditions, favorable to the normal condition of the plant, finally ends in its complete destruction, or partial disorganization, leaves it in so feeble a condition that it is not able to fully elaborate its starch, and instead of the dry, mealy potato, we have the soggy, waxy and watery one. It is no argument, for it is only a theory, against the theory that reproduction from seed does not bring it back to a healthful condition, for the seed being but a minute part of the whole plant, may necessarily be diseased from the parent, and might, perhaps, continue so for generations until it wears out, just as fever and ague wears out upon the human patient. But under fortuitous circumstances, it may at last regain its original health and vigor. That it has not done so yet, is apparent from the fact that to-day there is not in the United States a potato that combines the good qualities of the Mercer potato for an early variety, or for a late variety, the pink eye of 30 years ago.

Horticulturists recollect the consternation that was created by disease and death in the apple orchards of Southern Illinois a few years since. It was laid to a variety of causes, principal among which was the theory that root grafting was the cause, producing disease and decay, or in other words, it was *degeneration*, or a wearing out of the plant from decreasing vitality. Careful observation, however, showed the roots to be infested by the apple tree root-louse (*Pemphigus Pyri*), and now, under the microscope, we find fungoid growth also, which may eventually be proved to have as much to do with it as anything else. The warty excrescences, produced by the Aphis perhaps, inducing fungoid growth, and a poisoning of the whole texture. It is a great field that is being opened, this one of microscopic examinations, and facts are proving every day that our best teachers are those who are investigators as well.

It may, and does seem to many persons, otherwise intelligent farmers, that this labor of investigating the nature of microscopic fungi, both Phænogamous and Cryptogamous, so minute as has been before stated many of them, that under a microscope, magnifying 500 diameters, that the spores appear only as a fine mist, and it is quite probable that these tiny vegetable atoms may cause the loss of our potato crop, destroy our orchards, and render futile the exertions of the agriculturist. It is eminently proper that our legislatures should foster institutions having for their aim the diffusion of scientific knowledge, relating to chemistry, botany, vegetable physiology, mechanics and miscroscopic examinations, connected with the arcana of animal and vegetable life.

It is to be hoped that the Legislature of the great State of Illinois, one of whose citizens conceived this grand idea of industrial education, the education of the masses to their several pursuits in life. We say that we hope that the State of Illinois will not be allowed to fall behind in this great scheme of industrial education because we have not the purse of a munificent and philanthropic Cornell among us, but will especially foster those schools which have for their aim the education of the industrial classes—the farmer and the artisan. One of which shall more easily feed the multitude and add millions to the population, while the other shall harness yet undiscovered powers —an Archimedean lever that shall move the world.

The history of potato culture in Illinois shows plenty of failures, resulting from plantings in the month of May and early in June, for the reason before stated, that the hot sun and dry atmosphere of July and August, or else the sudden alternations of wet and dry, hot and cold, are not conducive to the steady growth which the potato requires. But even under these circumstances, we may measurably succeed, by mulching, when the conditions are such that early planted ones do not perfect their growth before the heat of summer ensues. My own practice, upon clay or heavy loams, has been to plant as early in the spring as possible, upon deep fall plowing, by marking the land three feet apart, making a deep narrow furrow, which will of course be left filled with the fine earth. If you plant in hills, mark the other way, two feet apart, and put two strong single eyes in each hill. If in drills, plant the eyes about ten or twelve inches apart, stepping upon each piece in order to press it firmly into the earth, or if two rows are planted at once, this must of course be omitted, in which case a roller may be passed over the land before covering by the cultivator or hiller. Notwithstanding the assertion that it makes no difference whether the eye lies uppermost or not, I consider it bad practice to allow some eyes to lie up and some down, since they do not appear above ground at one time; have them lie in the furrow as they are to grow, the eye up; cover about four inches deep. As soon as the weeds start, or the ground becomes encrusted, harrow thoroughly with a light drag, and continue to do so as often as necessary, until the rows can plainly be seen, then, with any suitable implement, turn a light furrow away from the potatoes, and within four or five days, turn it to them again, and continue to earth them from time to time, until at the time of blossoming, the vines will be supported by a moderately high and broad hill. If the vines now grow so as to cover the ground, and shade the ridges or hills, you may confidently expect to harvest a crop, unless the season is unfavorable, that is, wet and hot, or with alternations of heat and cold. I have gathered fine crops by filling between the hills with litter or fine manure, to obviate the effects of heat and drought. What the potato most craves, is a moist, equable temperature of the earth, which can only be obtained in variable seasons, by having the ground covered with the vines or mulch. If these conditions are secured, you will not be much troubled with weeds, but if so, you must get them out by hand or otherwise.

Neither potatoes nor any other crop will thrive among weeds. In case blight attacks them severely, cut the tops, but if slight, leave them alone, they may recuperate, and in no case when attacked by disease should you dig them to save them, they are safer in the ground than out, unless the land is very wet, in which case, if they are dug, they should be spread thinly, and some absorbent as lime, powdered charcoal, or dry muck, mixed with them. When thoroughly ripe, they may be dug and placed in narrow piles to sweat and dry, after which they may be stored where they are to remain through the winter. I have often been asked whether I would plant certain seeds in the old or new of the moon.

This planting in the moon, as it is called, is mere heathenish superstition, but like other pagan practices, which some of us follow, has fact mixed up with error. Seeds sprout more quickly in the dark, and grow faster in the light, and therefore if we plant that which is slow to germinate as the potato, in the old of the moon, it has the dark nights in which to break, and appearing above ground just as light nights come on, it absorbs carbon, grows apace, and vice versa. If we plant peas which germinate quickly in the new moon, *they* have the light nights to grow in, and so the fogyish, unscientific and superstitious planter has the facts on his side, only he does not know *why*. Therefore, if you must plant potatoes late, do it in the old of the moon, if it comes after the middle of June, but in this latitude, I should prefer to plant, especially if early sorts, the first of July, rather than the first of June; and this brings us to varieties. After having tried all the new sorts, except as such as sell at one to three dollars per pound. I still plant Early York or Buckeye, if it is Buckeye, in March, for early, and in June and July, for the late crops. And now about sorts. Last season I found but little difference in productiveness between Early Goodrich, Chenery and Sebeg, they ripened about together. Early York, however, produced the best crop. A new sort, Titacaca, said to have been brought from a lake of that name, in South America, was two weeks later in ripening, and were perfectly hardy in tuber, seed and vine. The first eatable potatoes were produced upon Chenery, June 15th; upon the 20th Goodrich, Sebeg, and Early York, were eatable; Jackson White, Calico, Peach Blow, and Harrison, were affected by the drought to such a degree, that they were a very light crop. They were all planted March 21st. More attention should be paid to the storing of potatoes than is generally allowed. Those intended for eating, should be kept as much as possible from the light and air, and all potatoes should be kept at such a temperature, as to prevent germination, but potatoes intended for planting, certainly sprout more kindly, and more quickly if they are exposed to the air, sufficiently in the fall to become even greened, before storing, on the same principle, perhaps, that the roots of trees dug in the autumn and healed in, get calloused and ready for growth in the spring. The planting of small potatoes cannot be too much deprecated, and why otherwise intelligent farmers will practice planting inferior and small potatoes, and at the same time be so careful in saving seed of corn and other cereals, is something wonderful. I have reduced a crop ½ in four years by the experiment.

A single strong eye, with a liberal quantity of tuber attached, is as good as more. In planting whole potatoes, none but the strongest eyes grow, while, if all the apparent eyes are cut out, there will still be latent eyes, which, under favorable circumstances, will germinate. The small potatoes, however, in this day of high prices, may be utilized thus: Select a certain portion of the best potatoes, sufficient for the seed of the next year to be saved from, and if you continue this practice from year to year, you may plant the small potatoes for the market crop; but in no case must seed be saved from the produce of these small potatoes.

It is not necessary that we send long distances for change of seed. I have proved, from my own experience, that plants will not degenerate, if care is taken to save seed from the best specimens, but will, on the other hand, improve. It may be expected that I should say something about insects injurious to the potato.

[The balance of this lecture, giving an account of the insects, noxious and beneficial, affecting the potato, is omitted, as the whole will be found in the report of the State Entomologist.—Sec.]

ROOT CROPS.

A Lecture by Jonathan Periam, Supt., etc., delivered Jan. 15. 1868.

ROOT CROPS:—THEIR CULTURE, ECONOMICAL VALUE AS FOOD, AND IN FARM ROTATION—ROOTS ESPECIALLY ADAPTED THERETO—COST OF PRODUCTION, ETC.

Root crops may be classified as follows: First, those having long tapering tap roots, more or less fusiform, as the beet, carrot, parsnips, radish, turnip, and salsify or vegetable oyster. Second, tuberous rooted plants, as the common potato, the sweet potato, Chinese potato, or Japanese yam, the chufa or earth almond, and the artichoke, and bulbous roots, as the onion, leek, shallot, garlic, etc. These therefore, hold before enlightened nations, a most important place as a sustainer of animal life, increasing always in importance, accord-to the density of the population. Only within the last one hundred years, have they occupied their proper place in the economy of animal life, and the rotation in farm cultivation, and have enabled Great Britian, especially to keep pace measurably in her agricultural development, with her commercial, and manufacturing interests.

The rudest form of husbandry known, is the occupation of a herdsman, but one remove from savage life, inasmuch as the savage hunts, kills and eats wild animals, and the herdsman, breeds, slaughters and eats domesticated, or half-wild cattle.

From thence by another step we have the cultivation of cereals, then the planting of vineyards and orchards, and lastly comes in the cultivation of roots, herbs, and flowers. A combination of these arts agriculture—horticulture being but a branch thereof, (the poetry of agriculture), pomology, arboriculture, floriculture, etc., being subdivisions again of horticulture, just as the breeding and fattening of stock, or the cultivation of the cereals, or of the grasses for hay, are sub divisions of agricultural art. Science in a high degree, can only be displayed by an individual in the study of one of these branches, and yet this subject, *agriculture*, has been too often looked down upon as being only fit to be subordinated to every other profession, and art in life, this *agriculture* which feeds the millions, and actually sways the destiny of nations.

It is altogether useless for the slovenly or negligent farmer to attempt the cultivation of Root Crops, since being of slow growth at first, produced from minute seeds, and requiring much labor, as compared with corn, wheat, and other grain producing plants, he will be sure of failure. In fact the so-called gardens or truck patches, of many otherwise good farmers, are a by-word and laughing stock to the passer by, the home of every vile weed that will grow in the climate.

There certainly is need of Agricultural Colleges in a country, where more than one-half of the farmers are content to live for three-fourths of the year on bread and meat, with perhaps a scanty and precarious supply of vegetables, when one hundred dollars expended in seed and labor, upon a single acre, would produce more healthful and better sustenance, than double the amount expended in pork and flour, and doctor's bills, besides the enhanced pleasure in a higher enjoyment of life, produced by a table laden with various vegetable productions, important among which are tuberous and other Root Crops.

It is absolutely essential to success in the economical cultivation of these crops, that the land be in high condition, or it will be necessary to bring it so by deep plowing, heavy manuring, and the cultivation of some hoed crop of easy culture, as corn and potatoes.

Attention is also necessary to the nature of the soil. If it is wet or tenacious, it must be rendered dry and friable by drainage and manures, which will act mechanically as well as chemically, always bearing in mind that root crops, except alliaceous ones, as the onion family, do not like recent manuring, unless it be compost, since it causes them to grow forked and knobby. The time spent in properly preparing the land will be amply repaid in the perfection and quantity of the crop. We stated in this morning's lecture that the potato ranked second among vegetable productions as a sustainer of human life. I now state that root crops come next in the scale of value as food-producing plants, and rank as follows: In that class, the beet, carrot and parsnip—all as esculents; and also the beet as a sugar producing plant, the carrot as a promoter of digestion, and the parsnip for its saccharine qualities and as an excitant to the appetite. In the second class named in this lecture, the common potato has already been noticed this morning. The sweet potato is well known for its sacharine and other nutritious qualities. The Chinese potato (*Dioscorea Batatta*), like other humbugs, has had its day, and therefore needs no other mention, but the Chufa (*Cyperus Esculentus*), or earth almond, I think ought to have a place upon every farm. It is a perrennial plant of easy culture, the foliage being grassy or rush like. The tubers are produced at the end of creeping-roots, varying in size from a hazlenut to that of an almond, which, when dry, they, very much resemble, and are a highly pleasant and nutritious food, especially sought by children. Their cultivation is easy. Plant the tubers in May, in drills two feet apart by six inches in the row; cover two inches deep; keep them free from weeds, and dig and dry them in the fall after frost comes.

The Jerusalem Artichoke (*Helianthus Tuberosum*) also is another plant which I think is generally under-estimated. It is of easy culture. It is not so rich in fat-producing principles, but in nitrogenous matter it is richer, as in sugar dextrine, albumen and casein, producing nerve, muscle, etc.

The next in the list for consideration, among root crops, are bulbs. The only one of principal importance, in an edible or sanitary point of view, being the onion (*Allium Cepa*), and deserves more than a passing notice. Notwithstanding the fact that over fastidious persons object to its use, it still holds its rank as it did among the ancient Israelites as being one of the first among vegetables. It belongs to the same natural order (*Liliaciæ*) as asparagus, the hyacinth, tulip, squills, etc. The onion delights in a rich, mellow loam, resting upon a dry subsoil, heavily manured with rotten manure. A good preparatory crop is peas, the land to be kept clean by frequent plowings; after removing that crop more manure may be added, and a crop of turnips sown after, which will leave the land in a fine condition for the next season's crop. Make the land thoroughly fine,. by repeated harrowing and rolling; it having, of course, been fall plowed deeply, sow the seed in drills, fifteen inches apart, leaving the plants close enough in the drills, so that they will crowd each other when swelling, at which time it is beneficial to draw the earth away somewhat from the bulbs. Do not work the ground deeply, but keep the surface mellow, that it may easily absorb the dew and rain; when the tops are dry the crop may be pulled and thrown into thin windrows, to harden and mature, after which they should be stored thinly in a cool, dry place until wanted. The cultivation of garlic, shallot and top-onion are identical with that of the common onion, except in the case of the garlic, the cloves are broken off and planted, and shallots and top-onions are produced by separation and planting of the small bulbs. The cultivation, like onions, is to keep free from weeds, and gather when dry.

The cultivation of the sweet potato (*Convolvulus Batattas*) is attended with considerable expense, but not so much so as to preclude its cultivation as a field crop in the central and southern portions of the State. About the usual time that farmers commence plowing for corn, the whole tubers should be laid upon a gentle hot-bed, upon about three inches of sand, on good earth, placing them about 2 inches apart, and covered with 4 inches of leaf mould, or some other exceedingly friable soil. The land where they are grown should also be made as mellow as possible by deep plowing and thorough working. The ridges upon which they are to be planted should be raised, in any convenient manner, as high as possible, 3½ feet apart, and the slips planted therein at a distance of 16 to 18 inches apart, and kept perfectly free from weeds, and the vines not allowed to root from their joints. They should not be planted, however, until all danger of frost is over, and the ground is thoroughly warmed by the increasing heat of the sun. In the autumn, if the season has been favorable, a crop ranging from 100 bushels to 200 bushels, and occasionally to 300 bushels per acre, may be expected.

Beets, parsnips, carrots, salsify, ruta baga and turnips, in garden culture, should be sown in drills about 16 inches apart, and thinned in the row to about 6 inches, except ruta baga and turnips, which should be thinned to 12 to 14 inches apart.

Radishes may be sown in drills 1 foot apart, and thinned to about 3 or 4 inches.

We now come to the field culture of the beet, parsnip, carrot, ruta baga and turnip. It is not for a moment to be supposed that the cultivation of root crops are of any economical value as compared with the corn crop, as estimated according to the value produced for a given amount of labor. If it costs 10 dollars to produce an acre of corn, yielding 50 bushels, it will cost 80 dollars to produce an acre of beets, yielding 1000 bushels. Your corn stands you in 20 cents per bushel, your beets stands you in 8 cents per bushel; therefore, we can produce 400 bushels of corn for the same labor that we can 1000 bushels of beets.

Ruta bagas and turnips will cost somewhat less, but are not so good for feeding.

Parsnips and carrots will cost as much as your beets, and will not produce so much per acre, but are richer for feeding.

Consequently, it is useless to argue with the stock farmer, at the present time, to prove the economical value of roots as a fattening crop, when raised upon old and recently manured land, but place root crops in their proper place in the rotation, and they will make a different exhibit.

In breaking up a clover lay, trench plow a portion of it in the fall 10 inches deep, paring the sod as thin as possible. Harrow and roll in the spring, when dry, until it is perfectly friable, drill your beets in before corn planting time, 30 inches apart, tend with a horse as much as possible, and besides once thinning and once hoeing, you should have but little more to do until they are gathered. This will reduce the cost one-half, and you may confidently expect 7, 8 or 9 hundred bushels per acre.

Ruta bagas may be sown upon sod. Trench plow in the spring, say about May 20th to June 1st, and turnips, broadcast, after early cut grass, or even as late as August 1st.

Mangle wurzel beet is the sort particularly adapted to field culture, from its habit of growing one-half of its length out of the ground, and instances are on record of 50 tons having been produced per acre. It is eaten greedily by both cattle, sheep and hogs, both tops and roots, and 4 bushels will fatten as far as 1 bushel of corn, as usually fed, and they leave the land in the best possible condition, without replowing, for any crop of small grain.

But it is especially to the farmer of but few acres, who wishes, nevertheless, to fatten as much stock as possible, in order to keep up the fertility of his soil, that root crops are particularly valuable. Upon the farm of 160 acres, and less, half may be devoted to grass and hay, 20 acres to root crops, beets, ruta baga, turnips, carrots, parsnips and potatoes, as follows: 10 acres to beets, 5 acres to ruta baga and turnip, 8 acres to potatoes and 2 acres to carrots and parsnips, the latter two to be fed to horses and milch cows, 20 acres to wheat or barley, 20 acres to corn, and 20 acres to oats or rye.

In the rotation here mentioned, the manure should be applied to the corn land and the sod before trenching for the root crop.

Within five years I should not be afraid to guarantee, if all the crops except wheat, barley and potatoes was fed to stock, and the manure saved and faithfully applied to the land, that the produce of the farm, in each ordinary season thereafter, would be, starting with good arable prairie land, faithfully worked: 160 to 200 tons hay, or its equivalent in meadow, 15,000 bushels beets, 5,000 bushels ruta baga and turnips, 600 to 900 bushels potatoes, and 800 bushels each of carrots and parsnips. This would give nearly 22,000 thousand bushels of roots, besides potatoes, which should produce 50,000 pounds of beef, mutton and pork, annually, which, at five cents per pound, would amount to $2,500 per annum, as the product of the 20 acres, besides the value of the potato crop.

But it is to the villager, or occupant of from one to five acres, that the cultivation of root crops are especially valuable. We have shown the quantities of the different root crops that can be raised per acre, and they are not fancy sketches by any means, but are far below what are often raised. I myself assisted, when a mere boy, in the cultivation of two-thirds of an acre of ruta bagas, in 1839, the produce of which was 1,300 bushels per acre, individual roots weighing 12 to 16 pounds each; and I have also in mind a prize crop of parsnips raised in the Isle of Jersey, in 1839, of 27 tons 8 cwt. per acre—30 tons, 1,440 pounds of the present day—1,229 bushels per acre, at 50 pounds per bushel. The carrot will produce, usually, more than parsnips, and four bushels are considered as good for feeding as one bushel of corn meal. The principal value of carrots, however, is in feeding with grain, from its peculiar principle pectine, and its action on the digestive organs enable them to more readily assimilate the other food. But to return to the village farmer: half an acre in beets will produce 750 bushels, and the mature leaves, stripped off from time to time, will feed a cow at night, and four hogs principally during the summer and fall, and give for feeding, for six months in the year, over four bushels per day, which will fatten one cow and feed another for milk; and a quarter of an acre of parsnips will thoroughly fatten the four hogs, besides feeding four more growing ones until the next spring. Thus the village farmer of 5 acres may raise 1½ acres of beets, parsnips and potatoes; half an acre of other vegetables; 1 to 2 acres of strawberries and other small fruits, besides corn and other crops.

The sugar beet, I believe, is destined to work a great change in the husbandry of many portions of our prairie land, and I see no reason judging from its success in France and Germany, why it may not only supply us with sugar, both for consumption and export, but in the vicinity of the establishments for its manufacture, so alter the system of rotation, as to be of great benefit to the farmer. Its success once established, will add millions to the agricultural wealth of the State of Illinois. It may be brought into the rotation once in 4 years, or oftener by the application of manure. A good rotation where cattle are fed on the refuse of the sugar mill, and the manure applied to the land, would be twice in a five year rotation, viz: on sward trench plowed, to be followed with small grain, then corn with all the manure, then beets, to be followed by small grain and grass, ½ of the farm to be in grass all the time, which would give 32 acres each year devoted to the production of sugar.

The cultivation of root crops, which has added so many millions of dollars annually to the agricultural wealth of Great Britian, and enabled that country to support its millions of population, is not simply due to the actual money value of the crop produced, but to the enhanced value accruing to the land by the feeding of cattle, sheep and hogs thereon, thereby increasing the production of the cereals by more than double over former years, and it is humiliating to us with our deep rich virgin soil, that we do not produce of wheat, oats, rye and grass, ½ that produced per acre by the English cultivator, and the difference is principally owing to the introduction of root culture in that country, with its attendant necessity, deep plowing; and the time is certainly coming when we too must adopt some such system to renovate our already partially worn land, and it is to be hoped that we may soon be enabled to institute experiments here that will tend to elucidate the facts connected with the renovation of our soils, by drainage. Deep culture, rotation of crops, a knowledge of soils and their adaptability to certain crops, and the economical value of feeding carefully upon our farms the product of our soil. This very county of Champaign which was formerly noted for its fine stock, is now dependant upon Texas and the Red river country for the steers she fattens. In order to keep up the fertility of our land, we must engage more in mixed husbandry, and in order that our land may carry its full maximum of stock, we must come sooner or later to the raising of root crops, unless something shall be discovered hereafter which will take their place. I should consider it one of the most important and interesting experiments that this university could institute, not that I suppose that an experiment in any direction, instituted and carried out by any public institution, could be prosecuted as cheaply as by a private individual, on account of the fact that the minute record kept, and other obstacles attending any public undertaking, tends to enhance the cost thereof, nevertheless, the results arrived at, are certain, and consequently carry weight with them.

I have compiled from various sources the following facts:

Indian corn, or maize, contains about 20 per cent. of water and woody fiber; wheat 30; barley 30, oats 36; rye 22 to 32; buckwheat 40; potatoes 79; turnips 90; carrots 88; mangle wurzle 87; the artichoke 86; the parsnip 86. According to another analysis the parsnip contains more water than the potato, and less than the beet and carrot, a larger per cent. of starch and dextrine, and less nitrogen than the beet and carrot. Experiments in feeding show, however, but little difference in their value for feeding, except in the case of carrots, which by promoting digestion thereby enhances the value of dry food.

A curious fact in the cultivation of roots is that stated by Mr. Stevens embodied in the agricultural report of the Patent office for 1847, that in the cultivation of Swedes, the drills 27 inches apart, and the plants 12 inches in the row, that an average weight of 8 lbs would give the enormous yield of 69 tons, 4 cwt. English, or 155,000 lbs=2,582 bushels per acre. Therefore, if we reduce the average weight per root of this crop 2 lbs, or would diminish the yield 645 bushels per acre, at 10 cents per bushel, would pay the whole expense of cultivating and gathering the crop, hence we see the necessity in root culture, of rich, clean land, and careful cultivation, and, in fact, a lesson may be learned thereby, that will suit as well for many other crops. As regards the feeding of root crops, the flat white turnips should be fed first, then sugar beets if any are raised, then ruta buga, and lastly mangle wurzel. These last may be kept good even to June or July with care. I would not from any remarks herein set forth have it understood that I consider that the time has come for making the cultivation of root crops an economical or necessary part of Illinois agriculture at present, except in the case of small farms and village plats, the great drawback, however, is the scarcity of proper help for their cultivation at the right time, nevertheless, I do assert that as the country is more densely settled, it will become more and more necessary, and that even now near cities and villages, where help and manure is plenty, it may well become an important part of ordinary husbandry.

ORCHARD FRUITS.

A lecture by Dr. E. S. Hull, of Alton, Ill., delivered at the Illinois Industrial University, January 19, 1868.

ORIGIN OF ORCHARD FRUITS.

To grow orchard fruits we must have orchard trees, and to grow either or both successfully, requires a knowledge of the laws of vegetable growth. These laws are so complex as to require careful observation, much time and thought. It is not our purpose to enter into a full explanation of these laws, and yet reference to some of them will be necessary in order that we may know how to modify their effects on our trees and on our fruits.

All our trees bearing improved fruit have been brought to their present condition by reproduction from one or other of the wild or unimproved species to which they belong. If we carefully compare the wild or uncultivated tree with one of their descendants, we shall at once be struck with the change which has been effected. The wood, the leaves, the fruit, how changed! One is ready to ask, can it be possible that such large and luscious fruits as Howell or Beurre Bosc pears could have descended from the harsh fruits of the thorny trees indigenous to the European and Asiatic forests. The apple, too, which has been called the king of fruits, once existed only in thickets in the same countries with the pear, as a thorny, compact tree, whose fruit was small, and of a quality not better than the fruits of our native crabs. From these, and from similar beginnings all our improved fruits were derived. This great change was produced in the simplest manner, viz: mainly by stimulating the growth. In this way an enlargement in the leaves and a slight increase in the size of the wood cells was effected. From trees thus wrought upon, seeds sprang up; these in turn, being subjected to similar treatment, in the next and succeeding generations, were further removed from the wild type, until at length the small, compact and thorny branch has been turned to one much smoother and larger, the fruit of which is of the highest excellence.

How great the change is which has been effected, will best be understood when we state that among all the species of fruits which are now grown in our orchards, not one of them, when in their wild state, could at all compare in quality with our persimmon. But all this has not been done, without to some extent affecting the hardihood of the trees. The cells of both wood and fruit, the leaves, the branches and the pores, all are so enlarged in our improved trees as to retain only a semblance of the native stock from which they were derived. With the structural parts so enlarged, comes countless blights and diseases which have, in the course of a few years, spread to all parts of the land. To some of these diseases, also to the structural change which takes place in the amelioration of fruits, we shall again briefly refer.

NURSERY TREES.

Orders for nursery trees are generally given to nurserymen residing north of the place where the trees are to be planted; this is done under the impression that northern grown trees are hardier than trees grown at home or south. When or how this conclusion was arrived at, we do not know, that it is erroneous we think may be shown. For example, if we examine trees grown far north, we find that their growth is often checked by frost at a time when the new cells, although perfectly formed, were yet soft. These soft cells resemble more those of succulent than hard wood plants. There will also be found to be present a large supply of unorganized materials for the formation of other cells which cannot be elaborated by the tree in its present condition, these young trees are therefore gorged with crude juices which are greatly expanded by the severe frosts of winter; the new cells are burst, and the unorganized materials in the tree ferment and destroy the healthy parts with which they are in contact. On the other hand, trees grown very far south are, on the approach of winter, sometimes in a condition so similar to trees grown at the north, as to deserve a passing remark. Owing to the great length of the warm season, trees at the south often cast their leaves at midsummer, and after a short period of rest, they make a second growth of leaves which cannot be matured before they are killed by the frosts of winter. When this occurs, both the northern and southern trees are in the same condition, both are largely supplied with crude matter which they cannot mature, and hence the trees of both sections will be found to be too tender to withstand, uninjured, our mildest winters.

If the facts we have stated are borne in mind, they will afford a clue to the treatment trees should receive at the two extremes of latitude, at which it may be desirable to grow them. For instance, a tree at the north should be so treated as to enable it to mature its growth some days or weeks earlier than they would do, if cultivated as they commonly are. On the other hand, trees grown at the south should receive such culture as would prolong growth to as late a period as possible, and thereby avoid the summer rest and tendency to a second growth. If these conditions are secured, the trees of both sections will be as hardy as those which grow at an intermediate point where they mature at the proper time without artificial aid.

SPONGIOLES OR ROOT HAIRS.

The removal of trees necessitates the loss of by far the larger part of their small fibrous roots, but not of spongioles, as is erroneously supposed; since, at the time trees are at rest, their roots are destitute of spongioles. That this is so, may be known by inspecting the roots in the spring. At this season of the year roots will be entirely destitute of spongioles, but as the period of growth arrives, from their sides, especially of the smaller roots, will appear many small warty excrescences. These excrescences are made up of a vast number of little bladder like cells, each new cell, as it enlarges, divides into two, and each of these again divides and is added to those already made; in this way it is, by the multiplication of cells, that new roots as well as other parts of trees are formed. It is to the sides of these newly formed rootlets that the spongioles are attached. These spongioles, or root hairs as they are sometimes called, are not roots, nor do they ever become such, any more than leaves above ground become branches. The office of the spongioles appears to be to extract food from the earth needed by the tree in the season of growth; they act in contact with the leaves, and in the autumn they separate from the roots. Therefore, from the fall of the leaf until growth commences in in the spring, all our deciduous trees may be said to be spongioleless as well as leafless.

Shall we grow our trees with branches starting from the ground, or shall we prune; and to what height? These and similar questions are now often asked. We think it would be superflous to give any instructions in growing fruit trees to low heads, since for the past sixteen or eighteen years all our journals, both horticultural and agricultural, have vied with each other in descriptions how best to accomplish, as they supposed, so desirable a result. Indeed, so much has been written on this point, that we have gone from trunks six to eight feet high, down to those of as many inches. These low headed orchards, on coming into bearing, have disappointed, or must soon disappoint their owners. The conditions attending the growing fruits are now so changed from what they were but a few years since, that trees with low heads are in the main no longer a success.

They increase the labor of cultivation many fold. The low branches cut off the under circulation, inducing disease in the foliage and not in the fruit. They invite insect enemies, and make it difficult if not impracticable, to arrest their ravages. In short, low heads are a failure, and the sooner we can induce people to start the heads of their trees at a proper height, the sooner will it be possible to successfully destroy insects, to ward off diseases, to insure color to the fruit, and make it practicable to cultivate quite up to the trees by means of horse power.

In planting an orchard, we select trees according to their kind, apricot, peach, plums and cherries, one year old, from bud or graft. Apples and pears, two and three years old.

The four first named, if well grown, will be not less than five or six feet high, and will have many side or lateral shoots branching out horizontally from the main or vertical stem. In addition to the side branches, there will also be found numerous buds extending from *the ground to the top of the tree.* Cut away all the branches and buds to the heighth of twelve or fifteen inches. Next cut away all the buds below the point at which it is intended the tree shall form its head, except six or eight buds, which are to be left at regular intervals and on different sides of the stem. These last mentioned buds will push into as many branches *as there are buds.* It will be necessary to keep these side branches pinched back to ten or twelve inches during the summer, to prevent them from running off with the growth and robbing those buds and branches selected for the future head of the tree. Sometime after the fall of the leaves and before growth commences in the spring, reduce the side branches to one bud each and when the branches from these buds shall extend to ten or twelve inches, pinch them as directed in the first year. The treatment will be the same the third year, as we have directed for the second, except at the end of the season, cut away all the side branches, except those intended *to form the head of the tree.* The object of the side branches, of which mention has been made, was to strengthen the stem or trunk of the tree. Without them the trees would have become top heavy and bent the trunks. Trees, grown as we have described, will have straight and tapering stems, which will be of sufficient strength in their fourth year to stand erect.

BUDS, GASSES STORED, ESCAPE OF GASSES, CAUSE OF DEATH, ETC.

To show the effects which frost, overbearing, and succulent growth have on the fruit buds of orchard trees, it will be necessary that we briefly describe those parts of the bud to which we shall refer. The buds of stone fruits of orchard trees may be separated into two classes. 1st. Those which contain single germs of fruit, as the apricot and peach; and 2d, buds that enclose several germs, of which most varieties of the cherry are examples. Since the structure in both of these classes of buds differ only in so far that several of the latter are folded in one envelope, a description of one class will answer our purpose for both. The germ of all our stone fruits at first consists of a single cell, and this is situated in a small cavity, which according to some bottanists consists of an embryo leaf folded by the tree into a form much like a vase, but more tapering at the top; the sides or wall of the cavity thus formed is made up of numerous small cells; to appearance these cells are built up around the germ cell much as a mason would enclose a conical space with brick, with the ends pointing to the center. The cells at first are soft and readily presss together so as perfectly touch each other and make a close wall. The forms of these cells differ from wood cells, in so far, that the exterior and interior surfaces are not pressed upon by by other similar cells as in woody structure, and hence they appear when viewed from either surface to be of an oval form.

The parts of the bud we have described, and to which we shall refer are covered with the corolla, which is the colored part of the flower, the calyx which forms part of the envelope of the bud, and the scales which enclose the whole.

Large and improved varieties of fruit we produced only on trees which have much larger wood cells, annual twigs and leaves, than seedling trees or those with small fruit. The buds of improved varieties are also large and the scaly portions covering the interior parts of the bud are folded together more loosely than in smaller ones; so large and loose are some of these exterior scaly coverings, as in the Melocoton family of peaches that it frequently happens that moderate freezing of the buds, especially while they are wet, partly enfolds them, so as to admit of the escape of what is believed to be carbonic acid gas which so long as it remained protected from frost, the little wall of cells which enclosed the fruit germ as in the peach. Gasses or fluids not only enclose and protect from the effects of frost the exterior wall of the cells that so round the germ cell, but the cavity in which the germ cell is enclosed is also filled with cabonic acid, gas or other fluid, as has been ascertained by puncturing, and to which experiment we shall again refer.

Hence it never occurs that the germ cell or the interior surface of the wall of cells surronding it can sustain injury until an opening is made in the wall by separating one from another the cells of which it is composed.

But so soon as an opening is made the gasses or fluid escape and the germ is killed.

That the escape of gasses or fluids stored in fruit buds is destructive to them, as well as to the embryo leaves inclosed in the leaf buds, may be known by piercing the buds with a small broach not larger than a hair. If this is done in cold weather, the bud, whether it be leaf or fruit bud, is immediately killed by freezing; but if we perform the operation on a warm day, the bud will retain its vitality until frozen. If we delay, and puncture the bud after freezing weather is past, then the germ of either leaf or fruit will grow as though the puncture had not been made; except in the leaf a small hole will appear, and the fruit will develop a scar at the wounded part.

It not unfrequently occurs that, very early in the spring, a small brown fly pierces the side of the wall of cells, to obtain the sweet substance stored within; this it often does without preventing the growth of the germ.

In view of these facts, it appears that the gasses or fluids are stored in the buds of trees only as a protection against frost. It will be asked, if the buds are protected against cold as we have stated, why the leaf buds are not killed at the same temperature that kills the fruit buds? The answer to this is, that the fruit buds have a larger share of nutriment stored in and around them, with which to commence growth, than is stored in leaf buds, and it is perhaps on that account that the fruit buds are most excited, and are first to expand. But, most of all, the less power in the fruit bud to resist extremes is due to the premature separating of the calyx and scales covering the bud, induced by growth of the interior parts of the bud. This inside growth of the bud is due to the increase in size of the individual cells that surround the germ, and as these enlarge they expand the outside coverings of the bud, so as to make them more susceptible to moisture and ruptures by frost.

Therefore, the power of buds to resist cold is determined by the condition of the buds at the time the freezing occurs. For example, in the winter of 1856 and 1857, at Alton, the thermometer indicated 20° below 0, and when carried a few feet away from the building, it sank to 27° below zero. Notwithstanding the severity of the cold, the Alton district was, the following summer, noted for its great yield of peaches. Our observations at the time went to show that the injury to the buds was only as one in eight.

Perhaps, at this point, we ought to explain the conditions combined to produce such favorable results. The trees having borne no fruit the summer preceding the winter to which we have referred, continued to grow until near the period of frost. There was, therefore, no premature swelling of the buds, as is quite common in the fall. The scales covering the interior parts of the buds were closely folded. Even the large and pointed buds of the Crawford's early and late varieties, which are classed among the tender peaches, were in a condition seldom seen at so late a period. The ends of the calyx and scales, which in these varieties usually appears to be partly open at the end of the bud, were so closely folded as to exclude moisture; in short, the buds were perfectly developed, and up to the time of the severe freezing, had not swollen in the least, and were, on that account, in a condition to resist the lowest temperature possible for buds of the peach to endure.

Perhaps no injury sustained by fruit buds is more common than the bursting of a single cell in the wall inclosing the germ cells. When hard freezing occurs, it sometimes happens that some of the cells pointing at the outer surface are ruptured; when this happens to only one cell, the exterior coating of the cell is held in place, and the fruit grows as though the injury had not occurred; except at these wounded places a scar will appear on the surface of the fruit. Also, in the early stages of growth, these wounded parts afford resting places, to which some of the cryptogamous plants attach and rot the fruit.

All our orchard fruits are more or less liable to this casualty, but most, some varieties of pears; next, the English Morello; the Heart, and some of the Bigarreau cherries; peaches and plums somewhat less, and, as a rule, apples least. The germs of all fruits are most liable to injury in the way we have described, the winter after they have produced heavy crops.

When two, three or more contiguous cells are burst, the fruit germ generally perishes within a few hours or days, or, if the bud blooms and the fruit matures, the scar remains and arrests growth at the wounded part. When several ruptures occur, but on different sides of the wall surrounding the germ cell, and the fruit matures, as is sometimes the case with some varieties of apples, then the fruit becomes knobby and of little value.

It not unfrequently occurs that fruit buds are changed to wood buds in the season of growth, this takes place only in trees, or parts of trees, that are making a very succulent growth.

All who are familiar with the practice of budding the peach, will readily call to mind examples of this in stocks budded early in the season. If, under a microscope, we examine fruit buds taken from a tree of very succulent growth, we find, in some, the single cell or fruit germ is wholly wanting, in other buds it is present, but the little wall of cells, of which we have previously spoken, is incomplete, one side being built up to the proper height, while in another part much is wanting, and in others the wall cells are so loosely placed as to suggest the possibility that many of the little cells had perished, leaving openings that remind one of a brick wall with many of its bricks pulled out.

This kind of defect in the buds of all our fruit trees is by far more common than is generally supposed, and often is induced by a cause directly the opposite of the one we have described, as will be known by an examination of buds grown on trees which have, the previous summer, produced an over-crop of fruit. A large proportion of buds on trees that have been overtasked are so like those of trees which make too succulent growth, that a description of one answers for both.

We well recollect the congratulations we once received of some fruit men, on viewing a vigorous peach orchard of ours, in its fourth year, which was then full of bloom. We also remember how hard it was to make them understand, on account of the vigor of the trees, that, on the whole orchard, not a single peach would probably be produced.

Similar examples with the pear must be known to many now present. It is not uncommon for estimates of pear crops to be based on the fine display of fruit buds, and for the whole to prove abortive, from one of the two causes last named, but especially to the latter, and not to imperfect fertilization, as is generally thought. All, doubtless, are familiar with the fact that certain free growing varieties of apples, as Northern Spy, Yellow Bellfleur and others, on rich land, are many years barren of fruit; the trees bloom but the germs are defective, by reason of the wood growth carrying away the nourishment needed to perfect the fruit germs. The tendency of some varieties of fruit trees to produce overcrops one year, and to pass through the following, or alternate, years without fruit, is well known. The varieties of fruit that are complained of are those only in which the tendency to wood growth is early completed, and at a time when both the roots and the leaves are active in elaborating plant food.

In some varieties all the food collected by the trees seems naturally to go to the formation of woody growth; in others it seems just as natural for the wood growth to cease in time for a portion of the leaf buds to change to fruit buds. When the terminal buds on the current year's shoots show themselves early, then the leaves continue active in the production of plant food, which is stored in all parts of the tree; buds which before were only leaf buds are changed to fruit buds; sometimes a large proportion of the leaf buds are so changed, and so large an amount of nourishment stored that a tree has been known, the following spring, without the action of the roots, to produce leaves and a full crop of fruit to more than half their natural size.

We have experimented with apricot trees by keeping their roots frozen so late in the spring that many of their leaves were fully grown, and the fruit had acquired more than half its natural size. Similar examples might be cited. For instance, grapevines have been planted in open borders and afterwards passed through the walls to the inside of a conservatory, in which fires were kept up. Such vines have produced both leaves and fruit of considerable size while the border, in which the roots were, was yet frozen.

It is wholly within our means to prevent overbearing or barrenness in trees. And he who is ambitious to grow fruit of first quality, or to the most profit, should thoroughly understand the peculiar habits of each variety and the method by which both barren or alternate year bearers may be made to yield a full annual crop of fruit.

To understand this we must refer to the trees active in growth. Trees which expend all their forces in the production of wood growth, can produce little or no fruit. Indeed, it is not possible for any tree to perfect a fruit germ and not again in some way disorganize it, unless the wood growth shall cease in time for the leaves to elaborate food enough to grow both leaf and fruit the following year, or until a part of the leaves shall attain to nearly or quite their full size. That this is so will be apparent, when we consider that the leaves, which first appear in the spring, were formed in the buds the previous year, perfect in all their parts, and in the embryo state contained each individual cell found in them when fully grown. But we are asked, if there is no addition to the number of cells, how do the leaves grow? The answer is, that the only difference we can see between an embryo leaf and one full grown, is in the size of the leaf cells. As growth begins in the spring, these small cells, which we found in the previous year, begin to expand; each individual cell thus enlarges until the whole of the numerous cells of which the leaves are composed are of full size.

To further illustrate this, let us suppose in a brick wall that each brick at the same time was gradually to expand several hundred times its present diameter, and you have just what takes place in the growth of an embryo leaf. Here we find the tree in possession of a full grown leaf. This leaf did not form itself, but was formed by the tree in the preceding year. To produce and sustain this cellular enlargement, there had been stored the previous year a large share of nutriment in the buds and in other parts of the tree; this nutriment, or plant food, must not only be sufficient to feed the embryo leaves, but must also be sufficient to produce the small warty excrescences, the rootlets and spongioles. These new leaves and spongioles are the trees' laboratory. And those leaves and spongioles first grown were made, with the exception of moisture, wholly out of the materials that were stored by the tree during the growth of the previous year. When these vegetable stores are in sufficient supply to do this, and nourish the fruit germs also, then we shall hear little about imperfect fertilization. On the other hand had the food been consumed the previous year by ripening an over-crop of fruit, or by making a very succulent growth, then the tree would not store a sufficient amount of plant food to perform its threefold office in the production of leaves, roots with their spongioles, and fruit. In this condition a part of the leaf, and the larger part or all of the fruit buds, yield up their nourishment, which goes to the production of root and leaf growth. The tree, therefore, is barren of fruit for the summer; its whole growth being required to recuperate the vigor of the tree. Such trees often bloom freely and cast their bloom. When this occurs uninformed persons often attribute this to want of fertilization, or suppose that the rains have washed away the pollen, and the like.

Having thus hastily referred to some of the causes of our fruit production and wood growth, we will now return and state, first, how we treat trees bearing alternate crops; and, second, how to bring unproductive trees into fruit. First, then, alternate bearing trees are such for the reason we have endeavored to explain, viz: exhaustion. What we have to do, then, is to economize and equalize the forces of the tree. If it be a Heart or Bigarreau cherry on which we are to operate, our first duty will be an inspection of the buds, that we may know what proportion of them is perfect. But before we proceed will have to state that the fruit buds on most cherries are produced on little spurs, as they are called; these are two, three and four years in forming. Each of these will likely have five, ten or more fruit buds, and each bud will contain several fruit germs. When all the germs are perfect, we have known as many as sixty fruits produced from a single spur, when not more than a dozen or fifteen could be properly grown.

Understanding as we now do the position of the buds on the cherry tree, we next determine their condition by an inspection of them, as detailed in our remarks on buds. Probably we shall agree, for a tree of which the diameter of the trunk is four inches, one-half bushel of fruit may be reasonably looked for, and for each additional inch in diameter four quarts may be added. Now, let us further agree on the number of cherries required to fill a half bushel. As our way will double and perhaps triple the size of the leaves, the fruit will be correspondingly large. Hence we reduce the usual number five thousand to eighteen hundred to fill the measure. Next, we estimate our buds, so many to each spur—five will be about right. Now, each of these buds ought to yield three cherries, fifteen to each spur; we shall need, then, only one hundred and twenty such spurs, but we will allow a few, and say one hundred and thirty, to provide the required amount. This determined, some time before the buds open in the spring, we prune away all the spurs except the requisite number, leaving those that are to remain evenly distributed throughout the tree. In addition to the spurs already formed there will be a great number of small one year old spurs developing for fruit for the next and succeeding years. Each year thin these out, always leaving as many again as you ultimately expect to reserve for fruit bearing, as some of them, under the treatment we have described, are pretty sure to run off into wood growth. Alternate bearing trees managed in this way cannot overbear one year, and hence will not require a whole year's rest in which to restore their exhausted energies, as would be the case had the trees received the ordinary treatment.

We now come to the second class, or trees of great vigor of growth, that show but little or no fruit, of which, among cherries, Napoleon Bigarreau is a good example. For a long time both cherry and pear blooms greatly puzzled us. It was easy to know that no tree could bear fruit without bloom, but it was not so easy to assign a scientific cause why vigorous trees, in full bloom, should produce none.

But after repeated microscopic examinations of fruit germs taken from trees that had made luxuriant growth, we determined the cause to be due solely to imperfect organization of the fruit germs, superinduced by want of nourishment. This then we suppose to be the condition of a barren cherry tree which we now propose to bring into full bearing. Trees that show great vigor of growth, produce a great excess of large and small branches. We will then first prune off this excess of growth so as to fully expose what is left. Next with a sharp spade we open a trench as deep as the lateral roots penetrate, and quite around the tree cutting off all the roots. We vary the operation according to the habit of the tree, so as to cut off what we estimate to be from one-third to two-thirds of all the root growth. Having finished the operation of shortening the roots, we fill the trench and give thorough cultivation to near the end of the season.

Peaches' and nectarines have sported into many varieties, and of each there are early and late. For instance, the Hale's Early peach, at Alton, ripens about July 28th, and the Heath cling at least six weeks later. Why the long interval in the ripening of the two fruits? With our present knowledge we cannot explain further than state, that on trees of the same age and under similar treatment, early and late kinds all bloom at precise the same time; or, if any variation as to time of blooming occurs, it will as often happen to one sort as the other. Therefore, the statement so often made, in the spring after severe frosts, that the buds of early peaches must be killed, has no force.

Another fact in relation to this fruit that we do not recollect to have seen noticed is, that all varieties early, medium, and late, grow alike at first, all at the same time reach the point at which the stoning or hardening of the pit commences; from this time, until the stoning process is perfected, the peach does not enlarge; therefore, the only difference in the time required to mature varieties must depend solely on the time required to harden the pits. There are yet other points to which we desire to direct attention. Varieties of both peaches and nectarines are divided into three separate classes, founded on certain characteristic markings on the leaves, 1st, varieties with globose glands; 2d, reniform glands, and 3d, those whose leaves are deeply serated without glands.

Glandless varieties are subject to mildew in the branches, in the leaves and in the fruit, in so marked a degree as of late, to be wholly worthless. In selecting varieties to plant this fact should not be lost sight of. Why it is that mildew most effects this class, in the way we have stated, is a point on which we earnestly desire light. Can any one tell us the office of the leaf glands?

Pruning the peach is probably not correctly performed by a dozen persons in the country. We have visited hundreds of orchards west and east, in not one of which was there the least evidence, that a correct theory had guided the hand in performing this important operation. It is singular what a hold false theories will take on the minds of men when disseminated by high authority; and perhaps none have worked more harm than those which relate to pruning the peach. We can no more teach this specialty on paper than we could anatomy.

Yet we can state some of the theories that must be recognized to insure complete success. First, and the most important of all, is a recognition of what we term true fruit leaves.*

We have already mentioned that a certain portion of the leaves, as well as fruit, was made out of the food stored in the tree the previous year. We have often queried when reading learned dissertations on pruning, if this fact was had in mind, or whether it had ever occurred to the authors that the leaves of later growth, as well as the fruit, from the time of stoning, were grown by those leaves that wintered in the bud. Leaves do not create themselves, but are in the main made by other leaves; hence every facility should be given to these first leaves to perfect themselves without much competition of leaves of later growth. We have demonstrated by repeated experiments that the fruit on any twig or branch will correspond to the size of the first leaves. Hence our term fruit leaves. We now see the importance of large leaves, and our next step will be to secure them. This we do first, by thinning out such large branches as should be removed; then cut back to some small branch or shoot which points in the right direction, those that are extending too far, or are likely to become pendant under the weight of fruit. Having done this, we next estimate the capacity of the tree for fruit bearing. For a tree six or seven years old, six one-third bushel boxes will not be too many. To fill these we allow forty-eight peaches to the box. If we allow two peaches to each twig, we shall require two hundred and eighty-eight such twigs. Cut away all others, except where new branches are desired. Many of these small twigs, or last year's shoots, on which the fruit is borne, will often have from ten to twenty or more young peaches, leave these until they are as large as a hazel nut, then reduce from one to three to each branch according to strength.

Before we close our remarks on the peach, we will refer to a new difficulty attending its cultivation, mention of which we do not recollect to have seen. As soon as peaches are as large as a pea, a snout-beetle makes a small round hole reaching quite down to the pit, or into the kernel; on which it deposits an egg; this egg soon hatches, producing a small white larva. The fruit drops to the ground soon after the egg is hatched.

We have often noticed these small fallen fruits, without until recently understanding the cause. So small is the round puncture made, by means of which the pit is reached, that it escapes notice, unless the downy substance covering the peach is removed. We believe that the operations of this insect do not extend beyond six or ten days.

As soon as the fleshy parts of the peach thicken, so they cannot reach the pit, their depredations wholly cease. Can it be that the mischief is done by the Plum Gouger of Walsh, or has some one of the numerous nut-beetles left its legitimate calling for the more genial pursuits of horticulture.

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* This term is arbitrary, but answers our purpose.

APPLES.

Until within a few years the apple was grown almost without care. Of late, however, so numerous are its diseases and insect enemies, that in some districts its culture is no longer attended with success. And unless we combine our efforts against its insect enemies we must wholly abandon its culture, or be contented to feast on the few wormy and knotty specimens which reach maturity.

So rapid has been the increase of the plum curculio and the apple curculio that in some districts these two insects, or even the plum curculio alone, are in sufficient force to totally ruin the apple crop. Hereafter, so far as we can now see, no escape from the ravages of these insects need be looked for, except by united effort in their destruction. So numerous have curculios become in our own grounds and surroundings, that for the past two years our Janet apples have been destroyed, and other varieties made worthless, except for cider. In the future we shall have to bestow the same care in catching curculios on our apple, that we do on our plum trees. Except in very early apples, the larvæ of the plum curculio do not perfect themselves, but the parts wounded by them furnish resting places for fungi where it multiplies and spreads to all parts of the orchard. Horticulturists must recognize the fact that as we increase the production of any fruit, we, at the same time, increase its peculiar insects and diseases.

PLUMS.

Thus far we have devoted no remarks specially to the plum, nor would we further trespass on your time, were it not probable that some varieties of this fruit may be grown to a profit in all parts of the State, doubtless, in many parts, with far less care than will hereafter have to be bestowed on the apple.

In this country the curculio has so long held undisputed dominion over the plum that a knowledge of the varieties of plums have passed out of mind. We shall therefore refer to some of the best, that those who desire to enter the field against the "little turk" may have fruit in quantity and of a quality to reward them for their labors.

For a single variety, for family and for market, we place the Jefferson at the head of the list. Three best for family, to ripen in succession, add Washington and Coe's Golden Drop. Four best, add Smith's Orleans. Five best, add Imperial Gage. Columbia is a desirable sort to plant in apple, pear and peach orchards, on which to catch curculios. The curculios would be attracted to these trees when in fruit, where they might be caught. The Columbia plum generally discharges so much juice into the passage made by the larvæ of the plum curculio as to drown them. On this account it is that we recommend it as a protection to our orchards.

River's No. 1 is one of the earliest plums with which we are acquainted. It bears moderate crops annually.

Dominie Dull.—Since the prevalence of the peach rot, this and the following were the only sorts that have wholly escaped rotting.

Ghiston's Early.—Tree grows slowly, very productive, quality good to very good.

Lombard.—Tree a moderate grower, alternate bearer, quality only good. We should have omitted the mention of this variety, had not an impression obtained that it was curculio proof; perhaps no sort is more preferred by the curculio.

Diamond.—One of the most productive and showy plums, of first quality for cooking, but too harsh for the desert.

Reine Claude d'Bavay, McLaughlin and Red Gage are good plums for the table, and may also be grown, to a limitet extend, for market.

GRAPES.

A Lecture by Hon. Geo. Husmann, of Hermann, Mo., delivered at the Illinois Industrial University, Jan. 19, 1868.

"The old has passed away, and all things have become new."

In these days of railroads, of telgraphs, and of machinery, when space and time are almost annulled, a great revolution is silently, quietly, but for that reason perhaps, all the more powerfully working its way through all classes of society, through every branch of industry, in the accoutrements of war, as well as in the graceful arts. Mankind travels with railroad speed, in thought as well as in action; and in no country perhaps is this more true, than in ours. We are a fast people, perhaps too fast in some things; but it is characteristic of the nation, that we take hold of everything we undertake with an energy, which is really startling to other nations. Young America is a giant, uncouth sometimes, perhaps; but with a vein of good common sense running through all he undertakes, and generally with a shrewd eye upon the almighty dollar.

That this is eminently true of American Grape Culture, I hope to demonstrate to you in the course of the following remarks:

Only short twenty years ago, Cincinnati and the banks of the Ohio river, were almost the only location in the country at all noted for grape culture, If beginnings had been made in other locations, they were not yet important enough to be worthy of universal notice. *Now*, the whole country, from the Atlantic to the Pacific, is alive to the importance of grape culture; and there is hardly a locality, even at the extreme north, where some varieties of the grape are not now grown successfully. *Then*, only one variety was considered valuable as a *wine* grape, the Catawba; *now*, we count them by hundreds, to which every day still adds further. *Then*, about two hundred and fifty gallons of wine to the acre, was thought a large average yield; *now*, we are not satisfied unless we average from six hundred to twelve hundred gallons, and the crude attempts at wine making of those bygone days, and their products would make but a sorry show by the side of our Cynthiana, Norton's, Herbemont, Delaware and Taylor wines of to-day; wines with which we can safely challenge the choicest vintages of Portugal, France, Burgundy and Germany. *Then*, we were entirely dependent of the seasons in the produce of our vineyards and the quality of our wines; *now*, the science of Gall, Petiot Captal and Frings has come to our aid, and can count with mathematic certainty upon having *good wines* always, and in every season.

But it is not alone in the quantity and quality of our wines and grapes that we have improved. We have also learned to grow them with much less labor. Instead of laboriously and slowly trenching the soil with the spade, to the depth of two to three feet, and burying the genial suface soil beneath the subsoil; instead of reversing the order of nature, we have become convinced that the grape vine, the most sun loving of all plants, flourishes better if the soil is left in its natural position. Where formerly the slow work of trenching and reversing the soil cost from one hundred and fifty to two hundred dollars per acre, we now take the plow and subsoil plow, and prepare an acre in a day, at a cost of about twelve to fifteen dollars. When formerly the vines were trained to stakes in the old slovenly manner, which took an acre of timbered land to supply the stakes for an acre of vines, we now make our light wire trellis, with a post every twenty feet, with half the cost and half the labor in tieing and pruning. *Formerly*, the vines were not summer pruned until long after blossoming, when they had become one tangled mass of shoots and tendrils, and the knife and very often the sickle were resorted to, to cut the Gordian knot, slashing and maiming the shoots, and denuding the fruit, thereby causing stagnation of sap, sun-scald and nearly all the evils to which grapes are subject. *Now*, we have learned to summer prune with the thumb and finger, thereby only gently checking the undue exuberance of growth, leading it into its proper channels, and simplifying the whole course of management, so that every boy and girl of ordinary mental capacity can now do the work in their father's vineyard. And last, but by no means least, we are growing *thousands* of pounds of grapes now, where there was *one* grown twenty years ago. The noble grape, the healthiest and most luscious of God's fruits, is no longer the rich man's luxury, but is within the reach of all.

There is no laborer so poor, but he can now grow or buy grapes for his wife and children, so that it has become a *universal* fruit. And what is more, when *one* gallon of wine was made twenty years ago, tens of thousands are made now, and we are on the road to become a *temperate* people. For, my friends, every wine-maker among you is an apostle of temperance; and if you produce that most innocent healthful and inspiriting of all stimulants, good pure wine, thereby supplanting those abominable poisonous compounds, which are now palmed off on the public as brandy and whisky, you do more for the cause of true temperance, than Gough and all the total abstinence lecturers in the country. It is not an insult to a *free* nation, to try and fetter it by Maine Liquor laws; to try to force people to behave like decent beings, and to forbid them to become beasts!

Look at wine-growing districts of other countries. Wine is *there* the every day drink of the laboring classes, and yet drunkenness is of very rare occurrence. And then look at our country, look at England, Ireland, Scotland! What do you see? Pictures of misery and degradation everywhere; the image of God transformed into a hideous mockery, family ruin and strife, neglected children, deserted wives. And have so-called Temperance Laws proved efficient against this? Quite the reverse. Man is so constituted that he he will have a hankering after forbidden fruit. Say to him "touch not," and many who would perhaps not have thought of it before, will now try to get a taste, of it, find it sweet because it is forbidden, and indulge oftener. It is an insult to manhood, in this the freest of all countries, to try and shackle the will of man by law. Punish disorderly conduct and drunkeness as severely as you please, treat the drunkard as what he is, a nuisance to society, but do not say to the sober, industrious laborer, "Thou shall not refresh thyself with a glass of good wine, when thy muscles relax from severe toil, when thy tongue is parched with thirst, because thy neighbor makes a beast of himself by drinking whisky and brandy to excess."

This, my friends, is the noblest mission of American Grape Culture. Let us offer a glass of good light wine at low prices to every laborer in the land, to cheer him on and invigorate him at his toil.—He needs it more than the rich epicure at his well-spread board, with every luxury at his command. And we can do it. We can grow and make good drinkable wine at seventy-five cents per gallon, and when it comes down to that, or even a dollar per gallon, its consumption will increase to a degree, which will astonish those, who are now afraid that the thing will be overdone, and the market glutted.

We do not *need* a single drop of European wine in this country, we can grow all that is consumed here, and we can and will *export* American wines. We have proved already, in these short twenty years, that we can produce wines equal to the best of other countries. Where is the Burgundy equal to, or better than our Cynthiana and Norton's? Where the Claret better than

Creveling, Clinton and Concord? Where the Rhenish wine with which our Delaware, Taylor, Herbermont and Cassady need fear comparison? And where is a better Sherry, than our Rulander and Hermann? I have tasted wines from all countries, at fabulous prices, but I predict to you here to-day, and I wish you to make a note of it, that in twenty years more, we will rival and surpass them all.

American Grape Culture is only in its infancy; the young giant is hardly awake; but he begins to see daylight, and when the child becomes a man, he will fill the land; and we will make wines so good and so cheap, that we can abolish the protective tariff, and still drive foreign wines from the market with our native produce. May we all live to see that day.

But, my friends, these are only generalities. I have tried to show you that the new era in American Grape Culture has commenced, that "the old has passed away, and all things have become new." But, myself a farmer, I speak to farmers; and I know, that they are practical men. Generalities will not suffice with them, they must be shown the why and wherefore, they want *facts* to convince them. If, therefore, you wish information upon any point, I would rather it should come in the shape of questions from you, and answers from me; and you can rest assured, that the answers will be candid, straight forward, and explicit, to the best of my ability. My knowledge is but limited, but while I do not pretend to be an authority, I acknowledge none, and have no secrets; for we all seek the truth, and should gladly impart what little knowledge we may have gained, to our fellow laborers.

SMALL FRUITS.

A Lecture by Samuel Edwards, of La Moille, Illinois, delivered at the Illinois Industrial University, January 19th, 1868.

Within the recollection of many who do not consider themselves old, the cultivation of an assortment of small fruits was confined almost exclusively to gardens of the wealthy, or for marketing in large cities.

Formerly, the apple and other orchard fruits succeeded admirably in nearly all parts of the Northern States, with but little care and attention.

There were few varieties of noxious insects, injuring trees or fruit, and they so limited in numbers, their depredations were scarcely noticed. By importations from the old world, the rapid increase of them and our indigenous varieties of insect enemies; the cost and uncertainty of growing orchard fruits has been greatly increased.

In sections of our country originally covered with dense forests, their almost entire demolition has occasioned climatic changes so great, as materially to lessen the products of orchards.

The small fruits being exempt from injury by the insect depredators of our orchards, and as most of them blossom so late as to run much less risk from damage by spring frosts—the ease with which they are protected from injury in winter by covering—maturing their luscious, health giving products at just the season of the year when most acceptable to the palate, and beneficial to the system—there is abundant reason for rejoicing by those who love horticultural progress, as we see the general, rapidly increasing attention being given to their culture.

Many, with only a few rods of ground, now enjoy them in variety and abundance, their numbers are yearly increasing. Those owning a homestead dimensions are counted in acres, should improve their borders and sides of fences, by planting small fruits. On the south side of a fence fruits are hastened, on the north retarded in ripening.

The strawberry, in its different varieties, is adapted to a great range of soils; most of them succeed finely on dry prairies, which produces fruit of better flavor, though not of as large size as are grown on the border of a slough. Doubtless this deficiency could be remedied almost, wholly by underdraining, deep culture, and special manures, though these have not, to my knowledge, had a thorough trial in our State. Where grown for market, trench plowing, followed by the subsoil lifter; clean culture in hills, mulching for protection from cold of winter and dirt in spring and summer, are more profitable than a less expensive course; yet the pioneer, without capital, will feel himself more than paid for his labor if he plants liberally of them on his ordinary prairie breaking, giving them no after culture except a slight mulching at the first beginning of severely cold weather, indicating that winter is near.

Where cultivation is to be done by hand, rows eighteen inches to two feet apart, plants a foot apart in the row. In field culture, rows three feet apart, plants a foot asunder. Use a line in planting, as the cultivation is much more easily done, where rows are perfectly straight. A bit of twine tied to mark each foot of the line, facilitates dropping plants at the right distance apart. We use a steel dibble for this kind of work, which opens a hole large enough to receive the roots well spread out, taking pains to press the dirt firmly about them.

Well rooted, young plants only, are suitable for setting. They should be taken up with a spade, being careful to retain the roots as much as possible, and to keep them from drying. Trim off any dead leaves, and shorten the roots to two and a half or three inches in length—puddle roots of all plants and trees.

Early in spring, as the land is in good friable condition, as a general rule, is the time for planting.

Good success is sometimes had in planting until near the middle of May, also if rather moist weather just after the crop is gathered.

In one instance, an acre set in August, made a good stand with me; have had several serious, and one complete failure of several acres planted at that time. Autumn planting is not successfull here, except the weather is unusually wet; advice of those who wish to sell plants, to the contrary notwithstanding.

Thorough, deep, clean culture is to be given the first season, taking care not to injure the roots to any considerable extent. For stirring the soil deeply, a half inch bar of iron, pointed at the lower end, fastened in a plow beam with handles is drawn by one horse as deeply as the ground has been previously plowed, doing the work better than any other implement known to me.

Cultivator and Harrow.—Runners are cut by hand with a hoe, or with a rolling coulter attached to a cultivator. Always bear in mind that it is much easier to stir the soil and kill weeds as they are starting, than when they have attained the height of a few inches; besides the added benefit to the plants by two such workings, at less cost than one, when too long delayed.

Some prefer to grow in what is styled the matted row system—planting in rows three and a half or four feet apart.

As the runners appear train them along the row, forming a mass of plants a foot or more in width.

In all cases it is absolutely necessary to mulch just before commencement of winter, covering the plants slightly with prairie hay, corn stalks, or similar material, which has no weed seed in it if possible. Straw is used when no better article is convenient, but is objectionable for the reason just stated. The mulching should be loosened up, early in spring, when danger of severe freezing over. It may remain until after fruit is gathered, unless there is danger of so many weeds as to injure the crop, in which case it may be removed to alternate rows the latter part of April, in my latitude (41½°), earlier at the south, give one good thorough working, remove the mulch to the rows cultivated, when balance is stirred, the work finished by placing the mulching around the plants, protecting them in case of drouth, and the fruit from dirt.

After gathering fruit, cultivate between rows, if on the matted row system, turn under a part of the plants, leaving a strip of them six inches wide. Draw a little earth around crown of plants, to receive the new roots, which put out above the old ones. Cut off tops of plants just above the crown, which causes the new roots to start at once.

The decaying mulch is, on our new soil, generally all the manuring required. In poor soils, annual dressing with compost, containing a liberal proportion of wood ashes, is recommended.

By permitting runners to occupy space between rows, the old plants can be turned under, after bearing three or four crops. With the successful cultivators of this vicinity, and other parts of the State, present, the discussion to follow these brief introductory notes, must prove very valuable. The value of different varieties, in various soils and localities, is a subject of great interest. We all know the Wilson—there are some varieties of a finer flavor, and new candidates for public favor, in considerable numbers, are annually announced as being far superior to any now generally disseminated. Some of these have proved very highly remunerative—to the self-sacrificing philanthropists who distribute them; but most of us are contented to defer purchases until plants are sold at less than $1 each or $10 per dozen—the customary rates.

The Raspberry is one of the most valuable fruits for drying and canning, by many deemed equal, and even superior, to the strawberry at time of gathering.

A deep, rich loam; rather moist than dry, is adapted to best success in the culture of the hardy American varieties. Deep tillage is very essential in preparing for a plantation. The ground can be laid off for planting with a small plow, run shallow. Where land is cheap, and it is desirable to do most of the cultivating with a horse and cultivator, six feet apart each way is a proper distance. Potatoes, cabbage, or some other crop can be grown in the spaces until the raspberries are of full size. With limited space, three feet by six is adopted generally, planting strawberries between the rows. Use only thrifty young plants, covering the crown a couple of inches. They may be set in the fall or early spring; if the former, a forkfull of manure should be placed over each one, removing it before the plant grows through its covering of earth in spring. In case the dirt appears to be liable to bake before the young shoot makes its appearance, the crust should be carefully loosened with a fork, down to the roots. Thorough clean cultivation should be given. Latter part of August cut back to within a foot of the base. If this is neglected, they are seriously injured, and sometimes die outright, in consequence of bearing a full crop the next year. Each succeeding year, shorten the main stock to four feet, leave the branches about a foot long. By this mode they grow strong enough to need no staking, yield more food and of larger size than if left to grow unpruned.

The old wood should be broken down, with any feeble young shoots, leave five or six of the best, in the fall, and give a heavy mulching of some kind of coarse litter.

The foregoing remarks have reference to the tall growing American varieties, which are propagated by layering the tips, covering them with two inches of dirt in September.

The Miami, Doolittle and Purple Cane have been well tried and are desirable varieties of this class; plants are hardy, bearing abundant crops of fine fruit.

The varieties which sucker from the root can be planted more closely; three feet by five is a good distance, setting three plants six inches apart, in triangular form, for each hill. The preparation and culture is same as for the taller growing varieties. Suffer five or six shoots to remain in each hill, treating any others that come up as weeds. Tips of shoots should be cut back one-third their length in the fall.

Brinckle's Orange, like many others of this class, is tender; in severe winters, kills to the ground. Its very fine quality induces many to grow it, covering the canes with earth late in the fall. With one hand to bend down and keep them in place, while another covers them with a spade, a couple of hours suffices to secure enough to give an ordinary family a taste of them daily through the season of ripening. The Philadelphia is a very abundant bearer; fruit of only medium quality; believed to be hardy enough to endure our winters, generally. Plants of this class are increased by suckers and root cutting.

The so-styled Everbearing varieties have not proved of sufficient value in my locality to make them desirable.

The Blackberry requires more space than the raspberry; six feet apart each way answers very well. They require shortening back late in summer, and thinning out of suckers, as recommended for the raspberry, and, for best results, very heavy mulching. Of late they are often winter-killed in the northern part of the State. W. H. Hausen, of Lee county, protects with corn fodder in winter, having the plants grown rather thickly, in hedge-row style, for greater convenience in covering.

Mr. Merritt, of Battle Creek, Michigan, has practiced laying down the canes in fall, and covered with earth. The roots are laid bare at the base, with a fork to manage the tops; one man places his foot against the stock at surface of the ground, bending the root to bring tops down to required position, another man covering with spade.

Lawton, when fully ripe, is fine; more tender than our natives. Kittatinny and some others are said to be hardier. The general mode of propagation is by root cuttings.

The currant and gooseberry require treatment so similar throughout, that their culture will be described in connection. A deep, rich loam, rather moist than dry, is best adapted to them. Although, for a time, in rich soil, they give abundant crops of fruit when neglected. It is greatly improved in quality and quantity by liberal manuring, mulching heavily, or clean cultivation. The bush form is preferable in our hot and dry climate, to growing them as trees. Late in summer, early autumn, or early in the spring are proper times for planting cuttings. Wood of one year's growth is best, cut in lengths of eight to ten inches; set four-fifths their length in well prepared, rich soil, press dirt firmly at the lower end, filling in loosely at top.

If cuttings are not planted until spring, it is best to cut them before severe freezing, wintering in moist sand in cellar. They frequently form roots an inch or two long during the winter, and make much more growth than if left on the bushes, till planting time. They must, in every case, be cut before growth begins.

Vigorous plants, one to three years old, or thrifty offsets, are suitable for setting in permanent plantations, four by six feet, good distances apart. Manure liberally each autumn, or cultivate clean but shallow early in the season, mulch heavily before very hot weather. When they are of full bearing size, shorten long shoots of the current year one-third their length each fall, remove feeble shoots and old mossy and decaying branches, thus keeping up young, vigorous wood for bearing. Burn up all trimmings to destroy currant borer.

By planting in shade of buildings, fences or trees, or by covering with some inexpensive material, they may be retarded in ripening, and retained on bushes, for use, several weeks.

Red Dutch, White Grape, Black Naples, Victoria and Long Bunched Holland leave nothing particular to desire for variety of near thirty varieties of currants tested. Cherry and La Versaillaise are large—may be identical.

Downing's Seedling, Houghton's Seedling and American Seedling are good varieties of gooseberry. The large English varieties are so liable to mildew as to render them worthless.

The currant worm is very troublesome in Eastern States, and is kept off by dusting the foliage, when wet, with soot from wood ashes.

Cranberry have been tried to some extent; have never known of their paying for cultivating in our State.

The barberry, from its extreme acidity, is not desirable for cultivation to any great extent; so far as noticed, it does not seem to be nearly as productive as in the Eastern States.

Though we have once seen the Chicago market glutted with small fruits of some kind, there is room all over our State, at our own doors, in most localities, for selling large quantities of fine fruits, at prices paying much better than ordinary farming. This was the case in Bureau county, at the time alluded to, when it was better to leave it to rot rather than pick for Chicago, without taking into account what can be used at home—worth more than money. For more than twenty years I have found a home market for hundreds of bushels of small fruits.

Our Allwise Father made no mistake when He gave man the fruits of Eden for his food, nor has man, by his wisdom, found a diet more wholesome or acceptable.

Anticipating confidently the presence of a large number of thorough, practical cultivators of small fruits, believing that the time would be more profitably spent in discussion and hearing the results of their experience than in listening longer to one; my endeavor has been briefly to introduce the subject for the evening.

SWINE.

A Lecture by Hon. Elmer Baldwin, of Illinois, delivered at the Illinois Industrial University, January 20, 1868.

My subject is the hog—a subject less poetic than that of the classic vine— less dignified than the story of the horse—the noble charger that bore the chivalrous knight to the combat, less inviting than Flora's fragrant breath, or Ceres or Pomona's bountiful stores. And it is very doubtful if the use of the product of the hog as human food is not decidedly deleterious to physical, mental and moral health and vigor. Yet the time is doubtless far in the future, when mankind generally will appreciate that fact, and cease to go the whole hog—and the hog is *not* without its classic fame, it has its legends both in story and song. The victor in combat with the wild boar was in the olden time a hero among his comrades, and he was rewarded with the smiles of his lady love. And there is no animal that has furnished the same amount of human food during the historic period. The hog belongs to the class mammalia order Pachydermata genus, *Suidæ* or *Sus.*

The fosil bone of the hog is found in the Miocene and Pliocene deposits of the tertiary strata, associated with those of the Mastodon and Dinotherium, that seems to have been the age of Pachyderm or thick skinned animals, only two of which order the elephant and hog have ever been domesticated. The fossil hog was shorter than the domestic hog of modern times, but was evidently his progenitor. The wild boar from which our domestic hog has doubtless descended, with its closely allied species, are disseminated over near the entire habitable globe, and have been the companion of man from the earliest antiquity. The hog is a perfect cosmopolitan, adapting itself to all climates. Omniverous in its diet, eating herb, seeds, grain, fruit, insects or flesh. More prolific than any domesticated animal except the rabbit, easily susceptible of improvement, and quickly attaining to maturity; it furnishes a cheaper and larger return of food for the outlay than any other animal reared for food. Consequently in an economical point of view, the hog occupies a prominent place, and is a source of income to the farmer; for ready sale, and certainly of remunerative return, is not surpassed by any other branch of his varied pursuits. Particular is this the case in the Northwestern States, where varied and cheap food, rich pastures make it the paradise of swine.

The census of 1860, shows that there were then in the United States 33½ millions of swine of which the State of Illinois contained 2½ millions, or about 1-13th of the whole. The census shows that the rearing of hogs is influenced by the price of their food and transportation; the pork costing much less for transportation than the bulky food of which it is made.

In 1860, the New England States had 10 hogs to each 100 inhabitants; Middle States, 31; Western States, 149; Southern States, 175;

Pacific States, 101; and an average of the United States, 106. During the year ending March, 1868, there was received in Chicago 1,883,873 hogs, estimated to be worth about 30,000,000 of dollars; and during the year ending January 1, 1869, there was received 1,706,000, the gross weight of which averaged about 230 pounds, and worth over $28,000,000.

The amount of this trade may very justly stimulate our farmers to inquire as to the best system of breeding, feeding and fattening and the best breeds on which to expend their efforts in the production of this important staple.

BREEDS AND BREEDING.

There are several good breeds which lay claim to public favor—none of which are free from defects, or which embody all the points of good hog—the Berkshire has retained the good opinion of the public longer than any other breed, and the improved Berkshire is probably our best breed. The Berkshire was first obtained by crossing the Neapolitan with one of the large English breeds. The Neapolitan is a descendant of the improved Roman hog, probably from their best, a proof of the skill of that ancient people in that direction.

Most of the improved English breeds were obtained by a cross of the large and rather coarse English hog with the fine and delicate Chinese. The Suffolk is the result of one of those crosses, and is esteemed the best breed in England. It is of fair size and retains in a remarkable degree the fine fattening qualities of its China parent.

The pure Soffolk is almost destitute of hair, a very serious defect under our scorching sun and dry and hot climate, it is rather tender for our western treatment, but in fattening gives a good return for all the food consumed.

There are several American breeds that have attracted attention, as the Magee hog in Ohio and the Chester White from Pennsylvania, both good hogs, but as yet hardly entitled to be called distinct breeds. It requires a long continued breeding in one direction with careful and judicious selection to form a distinct breed, so that all the pigs will be of uniform character, size, and form; till fully establishe there is a tendency to breed back generally to the most defecti progenitor, and till that tendency is overcome, the certainty of rer duction in its perfection cannot be relied on.

The Chester White, when distinctly established, will be as of the breeds are now valuable hogs, the square and deep forn and erect legs, broad and short head, quiet disposition, goo ing qualities and heavy weight, form a combination of good that can hardly be surpassed.

Although our best breeds of hogs were obtained b crossing and our future successful efforts will be perfe same way—yet the indiscriminate crossing practiced b cannot be too strongly condemned. There seems to be a mania for mixing all breeds, while the aim should be to preserve each breed distinct and pure. We often see litters of pigs with no two alike but each is a representation of some one of the eight or ten breeds whose blood is mingled in the genealogical compound. I once made a cross of the Irish Grazier, a large slow maturing hog with the Berkshire and then crossed that sow with the Suffolk—and the produce were three distinct breeds from the same litter—first, a fine delicate pig that would fatten at any age. Second, a medium sized hog that would fatten at 12 to 18 months, and third, a Grazier hog that would weigh from five to seven hundred but must be two or two and a half years old before they would lay on fat. Preserve the breed pure and distinct, should be the rule.

Both parents should be at least one year old before being allowed to breed, and if the female should be kept till five or six years for that purpose it would materially improve the size and vigor of the pigs; while breeding from young sows deteriorates both size and vigor. The period of gestation with the sow is about sixteen weeks or 112 days—during this period the sow should never be closely confined, but should have ample room for exercise with free access to water; the food should be generous but not too heavy and heating—such as will insure the most perfect health.

The best season for sows to farrow is April or early in May, an April pig is worth one-third more than a July pig, and more than double a September pig. Some breeds can be fattened at any age, but none will fatten as well at one year or much as at 15 to 18 months, any hog must arrive fully at maturity before it can be easily fattened. And an April pig can be kept till a year from the following January at less expense and trouble than a September pig. While suckling, the sow should have free access to grass, and should have a generous supply of tolerably rich slop, and if fed in a trough easy of access, the young porkers will soon learn to feed with her with decided benefit to themselves and the mother. At eight weeks old they should be weaned—and if they have learned to eat with the mother and are fed milk or dairy slop with a generous supply of fine bran or coarse meal they will not fall off but will continue growing without interruption.

A growing pig should never be fed corn to any amount, it contains too much oil and does not contain elements of growth—light grain, bran and shorts, with a good supply of grass and succulent vegetables should constitute their food. After weaning, a pig should never be made extremely fat, it checks the growth and injures their thrift afterwards—nor should they be permitted to become poor—a poor pig can never be made to attain the size or form it would have done had it never been stopped in its growth—like a hill of corn if it once becomes feeble and sickly, no after culture can atone for the injury done. A mangy pig is worthless and should be consigned to the golgotha where the dead animals of the farm are deposited.

Neat, cleanly and well sheltered accommodation should be provided for swine especially during the season of growth—the hog has been much slandered in relation to his uncleanly habits—in some respects the hog is more cleanly than the cow or the horse or most domestic animals. It is true like the Elephant and other Pachyderms he is fond of bathing, a cleanly habits and it is more the fault of his keeper than his own, that he wallows in mud when better accommodation are not accessible. But if young pigs have to lie in a damp and dirty bed, their skin soon becomes encrusted with scurf, the ears and tail frequently drop off and the growth is at once arrested. During the entire rearing to the term of fattening, the animal should be kept in a sleek, healthy and growing condition.

The natural instincts of every animal must be consulted and followed to produce the best results when domesticated.

The hog is impatient of both heat and cold—any unusual exertion during the heat of summer, especially if in full *flesh*, will frequently cost him his life, comfortable shade should always be provided, convenient of access, such as will protect them from the noonday heats of the summer sun—neglect of this is inexcusable cruelty, and will be a serious drawback from the credit side of the pork account.

Equally important is ample protection from the opposite extreme of the winter cold. Pigs dropped in the fall are unfit, with all the care that can or will be given by our common farm accommodations to pass uninjured, the severity of the winter season. Early spring pigs will do much better, but a well covered, well protected and well littered sty where the pigs will not lie more than one deep—and when their owner will not have the night mare from listening to their unearthly screams from suffering from the biting cold is essential to successful pork raising. And I do not believe that any good christian can say his prayers and sleep easily and quietly, while the whole neighborhood is made vocal by the cries of his freezing pigs.

During the cold season, a proportion of corn as food is not objectionable. It is well calculated to keep up the animal heat, and from the care and convenience of feeding, it is now and doubtless will continue to be the principal food at that season. Yet the best results wön't follow when most of the coarser grains with bran made into slop, and refuse apples, potatoes, or other roots or green food constitute the diet.

Dry grain of any kind is not the best feed, and for this reason the hogs that follow beef cattle highly fed with corn do better than when they receive the corn directly from the crib.

During the summer, before fattening, a clover or timothy pasture is indispensable to successful fattening and to economical production of pork—and the next best course is soiling with clover, timothy, or other succulent grasses or vegetables. Confinement in small pens and heavy feeding with corn, is the most expensive, as well as the least successful preparation for fattening in the fall that can well be adopted. If fed through the hot weather exclusively on corn, the teeth become sore and the animal is generally diseased. At killing time the livers will generally be found diseased, and it will be found impracticable to make them put on fat.

One autumn, when corn was worth twenty cents, a neighbor enquired of me if I could tell why his hogs would not fatten, and also saying that most of his neighbors made the like complaint. I replied that the reason was obvious, cheap corn was the trouble, not that ten cent corn is less nutritious than when the price is one dollar, but it is fed too liberally, and neither a hog or any other animal can stand full feeding with corn alone but a few months and continue in health. The proper course is to so feed during the summer as to preserve the animals in the most perfect health, keep them thriftily growing, and slightly gaining in flesh, so as to prepare them best for the fattening process, which is always more or less a health destroying process. With good clover or timothy pasture, a little corn or other grain is not objectionable, but they will do well on the pasture alone—they will grow but not fatten—and if kept through the summer on grass alone, will be in admirable condition to take on flesh, they will account promptly for every kernel of corn judiciously given them.

Their teeth and digestive organs are all fresh and in good condition, and with strong appetites and vigorous health, their advance to the condition of respectable porkers is easy and rapid. Sudden changes from solid to succulent food should be carefully avoided, and *vice versa*, the change from grass to heavy feeding with corn should be very gradual, especially as the fattening season commences.

There is one primary rule in fattening that should never be violated, the change of feed should always be from lighter to heavier, and never from heavier to lighter. Consequently, when taken from grass and vegetables, a little soft corn or meal should be gradually introduced. Corn cut while the kernel is in the milk is good food to follow the grass. The gradual hardening of the grain will be a proper increase of the nutrient quality of the food. When fairly established on a diet of sound corn, it should be fed on a clean floor, and in amount about what will be eaten but not so as to have a kernel left. The practice of leaving a quantity of corn more than will be eaten on the feeding floor is a very wasteful and bad practice. The nice point to ascertain is to find, by measurement, the amount that will be consumed without any waste, and then to always measure the feed, by that standard, varying the amount as their appetites require. There are no animals that will retain their appetite and thrive as well when fed to a surfeit, with the unused food blown and dirty constantly before them as they will with just enough to give healthy and full action to the digestive organs, and to preserve the appetite unimpaired. To effect this the last of each feed should be consumed with avidity. Thus the old adage, that the lazy farmer who leaned upon the fence while his hogs finished their meal, always had the leanest pork, has much significance.

Plenty of water, with occasionally a little salt, coal and ashes to correct the acidity of the stomach of the gourmand porkers, completes the required dietary. This system of feeding is adapted to corn fattening as practiced at the West.

Our eastern friends have a somewhat different system. First, having secured the necessary buildings, kettles, troughs, etc., they commence the fattening process by boiling vegetables, such as apples, potatoes, pumpkins, or any other that hogs will eat, and when thoroughly cooked, these constitute the food for the first few days, they then commence adding a very little meal, mixing it with the hot, boiled or steamed vegetables, so as to cook it thoroughly. When the mess has undergone a slight fermentation it is ready for use. The amount of meal is very gradually increased, till toward the close of the fattening season, when meal alone is given; the meal is of corn, oats. buckwheat, and barley, ground, either mixed or separately.

This system resembles the English practice, and aside from the labor required, is much more economical than the practice at the west of feeding on corn alone. Hogs are made equally fat in much less time.

When our grain can be made into meal as cheaply here as in New England, and labor shall be as plenty and cheap, the eastern system will deserve a fair trial here.

As to the value of corn when fed to hogs, farmers differ very widely. Instances are given, when, by actual weight, hogs have put on from 12 to 18 pounds by consuming one bushel of corn; my opinion is, that 10 pounds gain for each bushel of corn consumed is a fair estimate. At that estimate, pork at $10 00 per cwt. is equal to corn at one dollar per bushel—or at $5 00 per cwt. it is equal to corn at 50 cents—but to secure even that result, the management must be judicious throughout. Hogs kept in a close pen and fed corn through the whole period of their existence will figure up the profits on the wrong side of the balance sheet, and much depends on the breed; there will be a wide difference between results from a good, and inferior breed with the same keeping. There is much point in the reply of the man when his neighbor wanted to get some of his breed of hogs, that he would want his swill tub too. Yet, both a good breed and a well-filled trough are essential to successful pork raising.

I will only briefly notice some of the diseases of swine and their remedies, and will then relieve your patience. I have but little faith in specific medicine as a cure for hog cholera, or any other disease to which swine are subject, and I have very little faith in a sick hog.

My practice is to turn them loose where there is water, and leave them to nature and their own instincts. A larger per centage thus treated recover of any disease than when treated by any prescribed form of medicine. But a sick hog is poor property, and may be regarded, generally, as belonging to the debt side of the account of profit and loss.

The wild animals in their native haunts are seldom diseased. The wild boar in the forests of Europe or Asia, I presume, never had the cholera, but when domesticated his natural instincts are thwarted, his food is changed, he chafes under confinement; sometimes starved, then fed to a surfeit with filthy pens, exposed to cold and heat, it is not surprising that he becomes diseased.

The laws which govern the nicely balanced organism even of the hog cannot be violated with impunity. Every species of animal has its natural food, habits, condition and natural requirements, and the nearer those can be supplied, the more certain the immunity from disease.

Any cause that weakens the vitality of any animal tends to invite disease. The practice of *in and in* breeding has a most injurious effect upon swine, rapidly weakening the vitality, and in two or three generations rendering them worthless, if not extinct. When thus weakened, any exciting cause will induce cholera or some kindred disease.

Sudden changes of food, especially from high to low feed, or the opposite, exposure to excessive heat or cold, and an insufficient supply of water, are among the causes of disease to be avoided.

If all the requirements of comforts, good beds and shelter, appropriate food judiciously given, plenty of water for drinking and bathing, and all the natural instincts are supplied as far as practicable, even in a domesticated state, there will be little danger of disease.

The old superstition that disease is the decree of fate or of unpropitious stars, has long since been exploded, or should have been, and like every other effect is regarded as the result of tangible cause. Avoid the *cause* and the effect will never be developed. *Prevention* is better than cure.

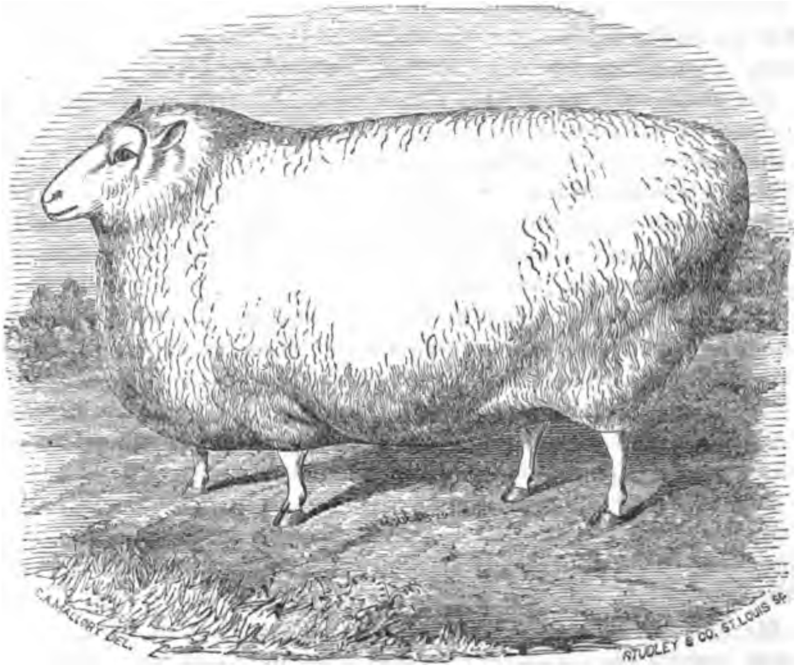
Like other domestic animals, the hog is frequently the victim of a cruelty which disgraces humanity. He is but a hog, and his stubborn disposition, which often is more than reflected by his master, is made the pretext for abuse and cruelty, but especially is he the objective point of all the worthless curs within his range; minus ears and tail, he frequently presents a living monument of his wrongs. A man frequently harbors a grudge against his neighbor, but is too cowardly to attack the man, but will dog his hogs instead. Such a man abuses his superiors.

Every animal we rear is entitled to our kindness and protection. Nor is the hog undeserving our regard. Instances have occurred where they have shown much intelligence and even affection. They have been trained to hunt, and the "learned pig" has often astonished the natives with his sagacious performances.

The acute instinct which directs the pig straight to his home, as the bee flies, miles distant, when he was conveyed in a tight box from home, round a circuitous and crooked road, is a performance that man, with all his faculties, can never imitate.

There is no animal so low in the scale but has characteristics that excite our admiration and wonder. They are all the handiwork of the Great Architect of Nature.

If we would rear them successfully, we must know their natures, their instincts and their wants, and we shall learn that the treatment that kindness and humanity dictates will bring the greatest pecuniary profit. As the path of duty is the path of happiness, so kindness to the most inferior animals we rear, is the best guarantee of success.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LINCOLN EWE.

LINCOLN EWE.—Bred by T. Marshall, Branston, England. Winner of first prize at Smithfield and Birmingham, fat cattle shows, 1863.

Live weight, 366 pounds; dead weight, 67 pounds per quarter; girth, 6 feet.

Five years old, bred five lambs, and averaged fifteen pounds of wool each shearing.

SHEEP.

A Lecture by A. M. Garland, President of the Illinois State Wool Growers' Association, delivered at the Illinois Industrial University, January 21, 1868.

As in the past, of all the domestic animals, none have occupied so prominent a place in the history and economy of civilized nations as the sheep—so at the present time no animal bears so intimate a relation to the comfort and necessities of the human family.

Among the many wise and bountiful gifts of nature for the welfare of the human family, none are so indispensable as this animal—furnishing as it does, at the same time, a food so wholesome and nutritious, and the most comfortable and healthy of our clothing materials. And we find that man was not slow in availing himself of so generous a gift.

"Abel was a keeper of sheep," and the firstlings of his flock, offered as a sacrifice, were acceptable to the Lord; and the frequent allusions to the sheep all through the Holy Writings and Prophecies, it seems were intended to have the double office of furnishing appropriate illustrations of the purity and usefulness necessary to the perfect man, and to fix ineffaceably upon the minds of the people of the then and coming ages, the prominence of this most indispensable animal.

The shepherds upon the plains of Bethlehem were the first of men favored with a look upon the brightness of the star that marked the birth-place of the Savior of the world.

Nor is this prominence peculiar to sacred history. We find frequent allusions to the sheep in the oldest writings of China, and Persia, and India; and representations of them are found carved upon the monuments of ancient Egypt.

More than two hundred and fifty years ago (in 1613), John May wrote, concerning the famous "wool sack" upon which the Lord Chancellor of England has sat for ages, as President of the House of Lords:

"The antiquitie of wool within this Kingdom hath been, beyond the memorie of man, so highly respected for those many Benefits therein, that a customable use has always been observed to make it the seat of our wise, learned judges, in the sight of our noble Peers (in the Parliament House), to imprint the memorie of this worthy commoditie within the minds of those firm supporters and chief rulers of the land."*

Mr. John L. Hayes, in an admirable paper, read at Philadelphia, in 1865, says of the sheep: "This species is endowed with a plasticity, so to speak, so remarkable, that it is more susceptible of modification than any other animal except the dog; so that 'the breeder,' as Lord Somerville says, 'may chalk out upon a wall a form perfect in itself, and then give it existence.' Hence peculiarities are developed in the coverings of different races produced by man, which make the distinctness and variety of fabric which characterize the wool manufacture; and thus we have the coarse Cordova and Donskoi wool for our carpets; the noble electoral wools of Saxony and Silesia for our broadcloths; the strong middle wools of the Southdown and our native sheep for blankets; the soft, long and finer merino wools of France, Vermont and Michigan for thibets, delaines and shawls; the longer and coarser wools of the Cotswold and Leicester races for worsteds in their thousand applications; the very long and bright haired lustre wools of Lincolnshire for alpaca fabrics, and, lastly, the precious, silky Mauchamp wool, the recent triumph of French agronomic skill, rivalling even the Cashmere, for shawls, and the Angora for Utrecht velvets."

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* See Smith's Memoirs, Vol. I.

The docility, hardiness, easiness of keep, and prolificacy of the sheep—strong arguments in its favor in semi-barbarous countries like Australia, South America, Africa, and some parts of Asia, are found to increase in force when mixed with the agriculture of more civilized nations.

SHEEP AS FERTILIZERS.

There is an old Spanish proverb to the effect that "gold springs up where the foot of the sheep has trod." This is literally true as applied to the wealth that lies hidden and undeveloped in the soil. It is certainly not necessary here to dwell upon the expediency—not to say absolute necessity—of maintaining the fertility of our soil. As fertilizers sheep are unrivalled among the domestic animals. Beneath their "golden hoofs" we see the fields of Great Britain, after centuries of cultivation, rivalling in productions of wheat, and excelling in their yield of grasses the fertile prairie lands of our own and other Western States. The preponderating, the undisputed testimony of many of the most successful farmers of Great Britain is, that farming, though now profitable, could not remain so, in many localities, without sheep.

Blest as we are with a virgin soil of unsurpassed fertility, we should constantly keep in mind the fact it is not inexhaustible; and the sooner we give heed to this fact, and learn to diversify our industry so as to preserve in our soil its original fertility, the better for the most of this generation, and all of the unborn millions that, after it, are to find homes and a livelihood upon the bosom of our vast prairies, and along the margins of our beautiful streams.

Sheep should be handled, upon every farm, in connection with the raising of grain crops. They occupy a place in the economy of the farm that no other animal can fill so well, in consuming the straw and cornstalks, and other refuse fodder.

The facility with which the product of the flock is transported is a strong argument in their favor. The greatest drawback in the raising of the great staple of the Northwest, Indian corn, is the expense of getting it to market. We daily see the price of corn quoted, in our lake shore and Eastern markets, at a pretty high figure; but the rejoicing of the farmer is pretty thoroughly allayed when he reflects that from one-half to two-thirds of this round price has to be paid to railroads for transportation. As sheep are usually feed in Illinois, it requires a bushel of corn to make a pound and a quarter of wool. How much better, then, to transform our corn into wool, which can be sent to the same eastern markets for one tenth to one-twentieth its selling price. The only better way than this would be, after having transformed our corn and grass and straw into wool, to bring the manufacturer to our doors, and let him and his operatives furnish a home market for the other products of the farm, while saving the transportation of the wool one way, and the cloth back again.

LEGISLATIVE PROTECTION NECESSARY.

Notwithstanding these incentives to a generally diffused sheep husbandry, the history of the "flock" in the United States is an eventful one. The instability that has characterized our national legislation, with its bearing upon wools, both in their raw and manufactured states, has shrouded the business of both the grower and manufacturer of this staple with a cloud of uncertainty, alike detrimental to the interests of both. So that the past history of sheep, with us, cannot be written, nor their future conjectured, without touching upon that principle of political economy affecting this and and all other branches of industry—the protection of the American against the competitive labor of persons living on lands without cost, in a climate without winter, under a government that imposes, if any, but a nominal tax, and in a state of society which requires but little for its support.

The grower of wool here needs to have the protecting arm of his government thrown around him, in so far that the necessities of his situation, such as high taxes for the support of the government, schools, the support of churches, and the other adjuncts of an advanced civilization, place him at disadvantage when brought in contact with the producers of wool who are exempt from these burdens. Without here attempting an argument in favor of a protective policy in our national legislation, let me say in passing, that, in my humble opinion, such a protective or *defensive* policy leads to the only road through which the American producer can ever reach that firm basis from which he can defy the competition of the world. France pursued such a policy until the justly celebrated Rambouillet wools were relieved, by their own excellence, from all competition, when even the producers themselves consented to the abolition of all duties.

The culture and increase of flocks of sheep are, with us, a national necessity. The United States, dependent upon Australia or South America for her raw clothing material, in the event of a foreign war, is at the mercy of any power that can man and float half a dozen war vessels. This insignificant force, by depriving us of the means to clothe our army and our people, could *freeze* us into terms that, under more favorable circumstances, could not be extorted by the combined navies of the world. I have no envy for the foresight of the statesman, or the patriotism of the journalist, who would place his country in a position exposed to such danger. We *must* defend both the agriculturist and the mechanic, the manufacturer and the laborer, against the cheap labor of Europe and the semi-barbarous countries, even though it *costs* something to do it. This was the policy of every manufacturing nation of continental Europe, after Peace had spread her wings over the desolated war path of the First Napoleon; and the result we see to-day in the thousands of workshops and factories that make Europe one vast beehive.

At that time the policy of England was to keep the other nations dependent upon her for their manufactures, not only of clothing but all other artificial necessaries; and one of her statesmen, Lord Brougham, while urging the great advantage to accrue from such a condition, said: "England can well afford to incur some loss in the export of English goods for the purpose of destroying foreign manufactures in their *cradle!*"

GENERAL SUGGESTIONS.

The period of gestation with the sheep is five months—though exceptions to the rule, in a variation of two or three days, and even somestimes a week, are not uncommon. The great fundamental law of nature, that "like begets like" finds no more exceptions with the sheep than with other domestic animals. In breeding use none but the best animals, and be careful that lambs do not come in the spring before you have grass for the mother. Attention to these points will relieve the farmer of much labor and loss, and go very far towards insuring a healthy and vigorous offspring.

WOOL PRODUCTS OF THE WORLD.

In the United States, with an annual clip of about 100,000,000 pounds, the home demand for wool exceeds the supply by nearly one-third. It may be of interest here for us to inquire for a moment where the wool is raised that clothes the world. The latest estimates available are German.* These place the production of the wools of the globe at 1,610,000,000 pounds, or one and one-quarter pounds to each inhabitant, calculated upon an estimated population of 1,285,000,000 people.

The amount set down to each country is as follows:

England	260,000,000	pounds.
Germany	200,000,000	"
France	183,000,000	"

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*U. S. Economist, June 10, 1865, also, address of John L. Hayes.

Spain, Italy and Portugal	119,000,000	pounds.
Australia, South America and South Africa	157,000,000	"
Russia in Europe	125,000,000	"
United States	95,000,000	"
British North America	12,000,000	"
North Africa	49,000,000	"
Asia, at a very general estimate	470,000,000	"

In the manufactures of carded or clothing wool, from statistics collected at the recent Paris Exposition, the leading countries of the world, stand relatively thus:

Rhenish Prussia, first for men's wear; France, first for women's wear; Austria second for women's wear; France second for men's wear; Belgium third for men and women's wear; Prussia fourth for men and women's wear; England fifth for men and women's wear; the United States sixth for men and women's wear; and Russia seventh for men and women's wear.

In combing wool fabrics, France stands first, and England second; the other European nations showing nothing to particularly distinguish them from each other.*

The largest flocks of sheep of which we have any knowledge are in Russia.†

Mr. Michel Bernstein, of Odessa, describes his production as follows: "The flock of Falz Feim consists of 400,000 animals. The last shearing produced 30,000 poods, washed, and sold for 870,000 roubles, or 2,974,500 francs," or in plain English 1,250,000 pounds, selling for $595,000. Another flock is mentioned, as the property of Mr. Tilibert, consisting of 70,000 merino sheep.

We have in the United States not far from 35,000,000 sheep of all breeds. By far the greater part of this number are of the merino family and its crosses. "The merino breeds are distinguished amongst the various types of the ovine species by the fineness of their wool, and the abundance of their fleeces." The product of these, with occasional combinations of foreign wool, and, I am sorry to say, sometimes, shoddy are made into the characteristic woolen fabrics of our country, such as plain and fancy cassimeres, sackings, repellants, tricots, beavers, cloakings, woolen shawls, and the different varieties of flannels. With proper encouragement the American grower will soon be enabled to furnish all the card wool or fine wool clothing needed by our population.

AMERICAN MERINOS.

It is cause for just pride to know that to such a high state of perfection has fine wool sheep husbandry been brought in Vermont and some other localities, that the American merino, now recognized as a distinct type, stands unrivaled in the ovine species for symmetry of

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*Report of E. R. Mudge, U. S. Commissioner of Paris Exposition.
†Ibid.

form, strength of constitution, and in compactness of its fleece. These excellencies are the more gratifying in view of the fact that they have been attained without the sacrifice of that hardiness and capacity for enduring long journeys, and aggregating in large flocks, that were such prominent characteristics of their trans-Atlantic ancestors.

Many prudent and successful feeders pronounce this the most profitable sheep for the stall, and they furnish a quality of mutton admitted by many good judges to nearly equal the famed Southdown. It is the generally accepted opinion of those best informed, that this class will furnish a greater return in *wool and mutton*, for an equal amount of feed and attention, than any other. The exceptions to this rule, if any exist, are to be found in close proximity to large markets, and upon very high priced lands. The weight of fleece from some of these animals is enormous, and shows, in an eminent degree, the success that has attended the efforts of the American breeders in improving upon the original stock as imported from Spain in the early part of the present century. Single fleeces weighing from 18 to 25 pounds are frequently taken from choice rams, while in a few exceptional cases, as high as 30 pounds has been clipped from a single year's growth. From ewes, fleeces have weighed from nine to sixteen pounds. This is, of wool in an unwashed state—and quite often is made up of gum or grease.

HOUSING AND PAMPERING.

The custom of housing, feeding too highly, and in every manner unduly developing and retaining within the wool the oily secretions of the animal, has been carried to an extreme no honest, practical breeder will justify, and has undoubtedly operated to the disadvantage of all parties—affording, as it has, the opportunity for the imposter to palm off upon the inexperienced purchaser animals either entirely worthless, or at best of very inferior merits. This practice has tended largely to bring "full blood" and "show sheep" into disrepute. Many who have been thus imposed upon now stand ready to denounce the "sheep business" as an unremunerative humbug, and those engaged in breeding choice animals as cheats and impostors. With the cynical statesman of Roanoke, they are ready to "walk half a mile any day to kick a sheep." The housing, and otherwise pampering of sheep is not, *necessarily*, a fraud. If parties resorting to such a custom would inform the purchasers of their animals of the manner in which they had been handled, *probably* no wrong would be done. I say "probably," for any one having experience in such matters, will appreciate the difficulty in arriving accurately at the real merits of an animal that has been thus highly pampered. At best it is a useless expenditure of time and money, and unless much intelligence and care are exercised will redound to the detriment of the constitution of animals and their offspring. Animals possessing real merit do not require any artificial adornments to recommend them to the breeder of judgment and experience, and the sooner the practice is abandoned the better for all parties.

The very severe tests by *scouring* to which many fleeces have been subjected, lately, demonstrate, however, a marked improvement in the weight of *cleansed* wool. The tests conducted by the Board of Agriculture of our own State, in 1866 and 1867, developed fleeces averaging from 5 to 7 pounds when thoroughly scoured; while in some Eastern States fleeces have been found to average as high as 6, 7 and 8 pounds—and at least in one instance, reached over nine pounds—[9 lbs. 3 oz.]. This considerably exceeds the weight of the *unwashed* fleeces of the best Spanish rams at the beginning of the present century—which Youatt places at 8 pounds, and Livingston at 8½ pounds. It may be of interest to note here that American merino rams are now being transported to Australia—sent there to give "quality and body to the degenerated wools of that locality."

TYPES OF THE MERINO FAMILY.

Of the merino family we have the different types of Spanish (which is the foundation of all the others), the French, the Saxon, the Silesian, and the American.

THE MAUCHAMP MERINO.

This part of our subject would not be complete without reference to a new, and now perfectly established race, remarkable for its soft and silky fleece, called the Mauchamp Merino. About forty years ago (1828), there was accidentally produced upon the farm of Mauchamp, department of Aisne, in France, cultivated by M. Graux, a ram lamb, badly, even monstrously formed, with a wool remarkable for its softness, and more especially so for its lustre, which resembled that of silk. Mons. Graux carefully raised this animal, and used it for reproduction, obtaining some lambs similar to the sire, and others similar to the dams. He then took the animals resembling the sire, and by a careful and tedious course of in-and-in breeding, succeeded in forming a small flock, whose wool was perfectly silky. After this he applied himself to the somewhat easier task of modifying their size and form, both of which were objectionable, and has so far succeeeded that his flock is said now to compare favorably in these respects with the French Merinos, of which they are an offshoot. A commission of Savans who reported upon the qualities of this new race, to the "Imperial Society of Acclimatation," say: "The silky wool is destined to replace completely in our own industry the Cashmere which comes from Thibet. It is fully as brilliant as Cashmere, fully as soft; and while it costs less as a raw material, it requires less manipulation to be transformed into yarn, since it does not contain the hair, which must be removed from the Cashmere."

It is greatly hoped that the utility of crossing the Mauchamp with the American Merino, will soon be tested by some breeder of the requisite capital and enterprise.

Since writing the above paragraph, I have seen the remarks of Hon. Jno. P. Reynolds, upon the Mauchamp Merino, in his able report upon the Paris Universal Exposition, and wish here to call attention to them as the opinions of a gentleman of enlarged and liberal views, and the result of a long study, having for its object the good of the Agricultural interests of our whole country. Mr. Reynolds seems to entertain no doubt that the cross alluded to could be made profitable in this country, in view of the greatly increasing demand for fine combing wools, and cites the result of experiments in crossing them upon the Rambouillet sheep of France, in proof of the correctness of his conclusions.*

LONG WOOLS.

The long wool breeds are generally distinguished by great precocity, and in raising them the item of mutton is the prime consideration, and that of wool secondary; and in England, where are to be found the most perfect types of this variety, a remarkable success has been achieved in the development of those particular parts of the body giving the best meat, and in producing animals capable of being fattened with the greatest economy, and at an early age.

This branch of sheep husbandry, presenting as it does, so inviting a field to the farmer, has been too long neglected. Of the long combing wools we consume annually some 6,000,000 pounds,* for a large proportion of which we are dependent upon the British Provinces, from whence we also draw largely for our supply of mutton. Since the abrogation of the Reciprocity Treaty with Canada, this interest has received quite an impetus; and if properly fostered and protected, will soon take its proper rank in the industrial economy of the country.

RECIPROCITY TREATY WITH BRITISH PROVINCES.

And here let me remind you, that a movement is on foot to re-establish the Reciprocity Treaty which, if successful, will be a death blow to the long wool interest in the United States, and, by sympathy, will greatly injure the fine wool interest. The committee on Ways and Means, at the last session of Congress, reported in favor of referring the question of re-establishing the treaty, to the Secretary of State, who is thought to be in favor of granting "free tickets" to such part of the world as he cannot *buy*. This reference, if agreed to by the House, is but one way of voting *for* the treaty, by dodging a direct vote against it, as Mr. Seward will of course recommend it to the Senate for ratification. The treaty as it formerly existed, meant only free use of the New Foundland fisheries for the fishing States, and free lumber for New York, and so far as the agricultural interests of the country may be concerned had no reciprocity in it. The true policy for us stands opposed to letting any people have the free use of our markets who do not help us pay the expenses of this government. If Canada, or any other country, wishes to enjoy our commercial privileges, let her throw aside the soiled and ill-fitting garments of royalty, and enter into the fold at the open door, for whoso "climbeth up some other way, the same is a thief and a robber."

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*Report of Jno. P. Reynolds, to Governor of Illinois, 1868.

*Mudge's Report.

VARIETIES OF LONG WOOL SHEEP.

Of the long wool varieties those most generally introduced into the United States, are the Leicesters, the Cotswolds, and the Southdowns—though some others are finding their way among us.

The *Leicester*, (probably more generally diffused through England than any other variety) is the result of the remarkably successful efforts of Robert Bakewell, (for whom they are sometimes called,) to produce a profitable mutton sheep. His experiments commenced more than a century ago, and, to use the language of another, "was a successful effort to form a sheep suited to low land and rich pasturage, that would produce the greatest amount of salable mutton, from the least food, in the shortest time." Their peculiar propensity for fattening may be inferred when it is stated that animals with a coating of fat six inches thick around the entire body, are not uncommon.

The *Cotswolds* are a hardier variety—generally exceed in weight, and mature as early as the Leicesters. After these we have the family of "Downs," at the head of which stands the justly celebrated *Southdown*—furnishing the most popular mutton, both in this country and England, from whence they were imported. They more nearly approach the Merino than any of the longer wooled varieties, in their ability to subsist on scanty pasturage, and to endure severe exposure.

The *Hampshiredown* is the offspring of a Hampshire and Wiltshire ewe coupled with a Southdown ram, and exceeds the latter in size of carcass and weight of fleece.

The *Shropshiredown* is the result of several crosses between the "Clun Forest," the Ryland, the Hampshire, and the Southdown. Their chief characteristics are their fecundity and freeness from liability to disease.

The *Oxford-downs* were produced by coupling Cotswold rams with Hampshire ewes, with an occasional dash of Southdown to perfect the cross.

Of the Lincolns, the Herefords, the Cheriots, the Romney Marsh, and other varieties not yet introduced in this country in any numbers, I will not take time now to speak.

GENERAL REMARKS.

The late civil war gave a wonderful impulse to sheep growing in the United States, as evinced by an increase of ten millions in the number of animals, and a heavy per cent. in the amount of wool. The very general desire to embark in the "sheep business," is fresh in the minds of all. Men of every capacity and avocation made haste to get rich by becoming the owners of sheep. The reaction from this excitement, owing to a number of causes readily understood by the business man, has been so severe that under its pressure many have become discouraged, and are turning their attention to other branches of business. Flocks have been sold for less than the value of a single year's clip, or have been slaughtered for their pelts and tallow. Like Bunyan's Pilgrim, we have long walked in the "Valley of Humiliation;" but I firmly believe the darkest hour has passed, and that the immediate future for the wool-grower has in it much of encouragement. The stock of raw wools is so low, that already we have complaints from purchasers that they have a limited opportunity for making selections. The past year has seen a holocaust among the flocks of the country without a parallel. Nearly forty thousand sheep, per week, for the last three months of 1868, were slaughtered in the city of New York alone; while Boston, Philadelphia, and other cities have absorbed more than their usual average. The city of Chicago, consumed during the entire year, some four thousand per week. We did not raise as much wool in 1868 as we did in 1867, and the clip of 1869 will show a still further decline. So, reasoning from the well recognized laws of supply and demand, both wool and mutton must bring a fair price for sometime to come.

The relative position of wool in our makets for the past two years, has been an anomalous one. The average price of wool in Boston market, for 35 years preceding the war, was, according to the report of the Revenue Commissioners, 42.8 cents, and that it will soon find its level with the other products of the country, there can be no doubt, *except the stability of the present tariff*, which is just now beginning to show something of its legitimate effect. Let the tariff upon foreign wools be repealed, or materially modified, and the days of prosperity—almost of hope—for this great interest are over—until such time as the wisdom or necessities of our people shall demand its re-enactment.

In proof of the correctness of the foregoing views, let me call attention to some speculations upon the future of wools, in the New York *Economist*, a paper whose unremitting devotion to the importing and free-trade interests ought certainly to relieve it of all suspicion of an intention to excite the market in behalf of the domestic wool-growing interests; it says: "The heavy importations of wool of 1866, are about all worked off, with very little wool in the country to fall back upon. We do not see why wool at present prices is not the best property at the present time for an investment, and we think those parties who are now laying in stocks are acting wisely, for we cannot see what is to prevent an advance of wool. We do not think the plea that manufacturers are well stocked is a valid one. Nor do we think those farmers are acting wisely who are selling their sheep at a monstrous low price, or slaughtering them for their pelts and tallow. We think it would be well for them to remember the old adage of 'waste not, want not.' * * * * If farmers will be reckless, and sow the wind, simply because things do not exactly suit them, they must not be surprised if they do have occasionally to reap the whirlwind! They may depend upon it, that for the next ten years sheep husbandry will be the best investment that can be made in agriculture."

In view of the fact that the United States has but one sheep to 57 acres of her domain, and as we produce but little more than two-thirds of the wool we manufacture, and a much smaller fraction of the amount we wear, sheep husbandry certainly does present the most inviting field now open to the American farmer; and why the prosperity vouchsafed to those who embark in it, by the eleventh-hour prophet of the Economist, should be limited to ten years, I can see no good reason. Our people are rapidly learning that mutton is the healthiest of all meats; and that they are promptly acting in the light of this new knowledge, the reports of the live stock markets at the great commercial centres abundantly prove. Why, then, should the wool grower be discouraged? That with an over-stocked market, a general financial derangement, and an unsettling of values, incident to the transition from a time of war to a time of peace, the result has been very unsatisfactory footings upon their balance sheets, for two years past, no one can gainsay. But what branch of business is exempt from vicissitudes? The fact is, that wool has shown, for a series of years, fewer, and less extreme fluctuations, than any other commodity the farmer has to sell. A review of the market quotations in Chicago for ten years, show that the highest price wool has sold for is $1 per pound, and the lowest 27 cents; the highest corn has sold for is $1 12, and the lowest 38 cents; the highest wheat has sold for is $3 per bushel, and the lowest 58 cents; the highest hogs have sold for is $13 per hundred, and the lowest $3; the highest hops have sold for is 60 cents per pound, and the lowest 4 cents. Showing for wool a fluctuation of 369 per cent., against 300 per cent. for corn, 500 per cent. for wheat, 430 per cent. for hogs, 1,500 per cent. for hops—or 369 per cent. on wool against an average of 683 per cent. on all other products.

CONCLUSION.

Though days of adversity may occasionally overtake the wool-grower, let him stand firm, hold fast, take good care of his sheep, and in the end they will take good care of him. The sheep never dies entirely insolvent. Even when starved to death, he leaves his pelt as a legacy to the cruel master who denied him food.

No business is exempt from vicissitudes, as can be read in the melancholy history of the wheat-grower. Winter-killing, blight, rust, the chinch bug and the midge have made his fortune a checkered one. The grower of five and ten cent corn has had his share of misfortune in years past. The hog cholera has plowed its deep furrow through the fortunes of the pork grower; and to-day the Texas or Spanish fever hangs, as a sword of Damocles, over the millions of cattle that constitute the present wealth, and upon which are built the high hopes for the future, of so many farmers!

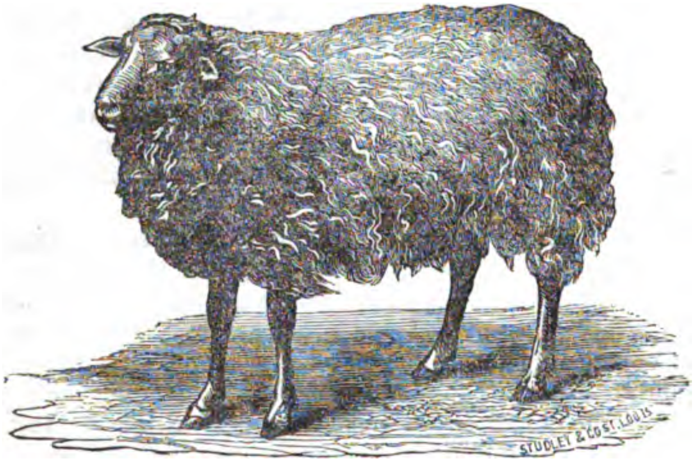
Though the prospect may not be dazzling, no surer avenue to an independent prosperity is open to the people of this country than the one presented through an increase of the growers and manufacturers of wools. Nature has placed within our grasp all the elements that go to make a people great. Millions of acres of grass annually wave a welcome to flocks and herds that come not, and, in their turn, go down before the destroying fires of autumn, to mingle their ashes with the accumulated fertility of the centuries before them. Unnumbered streams unceasingly ply the water-powers that can be had if we will but take them. Inexhaustible coal beds wait for the developing hand of the miner, as the bride waits for the coming of the bridegroom; and when, assisted by fair and judicious legislation, state and national, we learn to utilize all these gifts so lavishly bestowed, *then*, and not till then, will this mighty, undeveloped valley of the Mississippi be, what God intended it should be—not alone the *garden*, but the *granary*, the *factory*, and the *workshop* of the world!

FRENCH BREEDS OF SHEEP,

AND THEIR IMPROVEMENT BY CROSSES WITH THE SPANISH RACES.

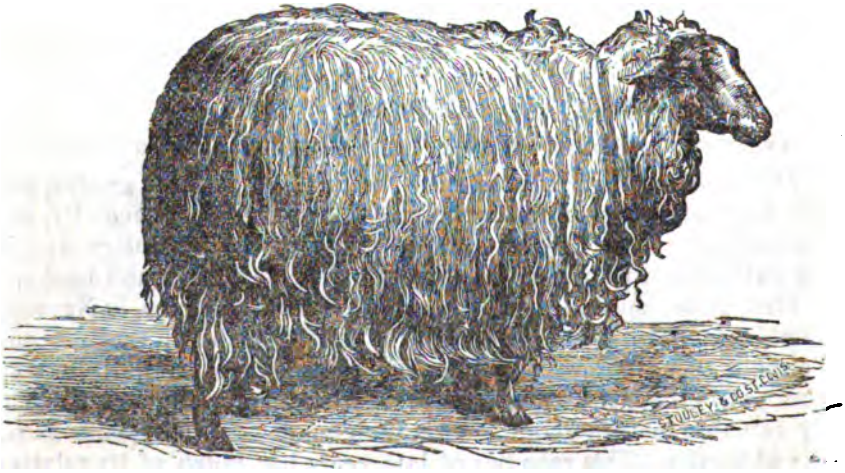
The breeds of sheep in the north of Spain form three groups, perfectly distinct and characterized; first, by their form; secondly, and principally, by their fleeces. These three types are designated in their native country under the names of Merino, Churra and Lacha.

First of the merinoes, or fine wools. The merino race, in Navarre, resembles somewhat the type which is usually found in France and other countries of Europe, under the same name. Small in size, rather pot-bellied, and altogether presenting a sorry appearance. The only valuable feature about them is their wool. This is short, frizzled, fine and knotty. This race has of late years lost much of its relative value, even in Spain. Raised principally in Estramadura, New Castile and Soria, it forms the major part of the migratory flocks; nevertheless, this race is now less appreciated in the north than in the west of the Peninsula. Increasing slowly, yielding only a medium quality of mutton; they are not even profitable for their wool, which, though exceedingly fine, is too little in quantity to make up for the other inferior qualities. Consequently, this race is very little noticed in the fairs and other agricultural exhibitions. The highest prizes being given to the other races, which are usually much better represented.



THE CHURRA.

Second, The Churra Race, or Curly Wools. They are much more numerous in Navarre, and infinitely more esteemed than the preceding race. They are much stronger and taller, wide in the shoulders, and closely built in the hind quarters. The wool is of medium length, curly and rather coarse. They are held in high estimation for the fine quality of their mutton.



THE LACHA.

Third, **THE LACHA BREED, OR LONG WOOL.** The distinguishing marks of this breed are, medium height, larger in the hind quarters than preceding race, a fine head—black sometimes, small horns, and frequently without any. This race is particularly remarkable for the great length of its wool, which sometimes measures 30, 35 and even 40 centimetres (12, 14 and 16 inches), hanging frequently to the ground, and giving to the animal a very singular aspect, very much resembling the lama.

This curious race lives upon the southern slope of the Pyrennes, to the north of Navarre, and principally in the districts of Irun and Valcarlos. It lives constantly out of doors, night as well as day, either in sunshine or shade, remaining, without inconvenience, exposed for weeks at a time to constant rain, which slips off from their thick fleeces without hurting them in the least.

They are never fed, except when the snow covers the ground, and then only a little straw and dried leaves, which serves to sustain them till the snow disappears. Some shepherds, during the lambing season only, place their flocks under shelter.

Their mutton is reckoned a little less valuable than that of the Churra race, but is nevertheless of good quality. With a little extra feed they fatten rapidly.

Their fine fleeces are very valuable, and they supply the greater part used in the fabrication of the famous Valentian cloaks. It is remarkable that this race, to which its long wool gives such a characteristic aspect, although living in the same manner as other races, is not subject to so many diseases, and especially those which so often decimate the other Spanish races.—*Le Journal d'Agriculture Pratique.*

AGRICULTURAL BOTANY.

A Lecture by Assistant Professor Thomas J. Burrill, deliveered at the Illinois Industrial University, Jan. 21, 1868.

As we look abroad over the land we see upon every side, in infinite variety and endless forms, evidences of vegetable growth. The stately century-clad trees of the forests, the fragrant flowers of spring and summer, the nutritious grasses weaving their carpets of green and yielding their riches in almost every quarter of the inhabitable world, the mosses and lichens that cover the bark of trees and wreathe themselves in curious forms even upon the tombstones of our cemeteries, the green scum of stagnant pools, the moulds that cover as with hoary age the damp walls of our cellars, and infuse themselves into the neglected preparations of our food, and other forms still more minute, that irreverently plant themselves in the very tissues of our own bodies, causing eruptions, ringworm, and possibly scores of eases yet to be ascertained—these, and such as these, in the countless hosts of their number, their myriad forms, their untold value and their seldom ever appreciated importance, are the rich legacies which the vegetable kingdom, in the accumulated ages, has left and is still leaving as the munificent inheritance of man. We cannot fix the price of their value. Mathematics may extend its line to the sun and weigh with poised balance, the innumerable worlds of the heavens, but its widest reach and greatest bearing, forms but the alphabet of an expression for the worth to us of plant life. Let us bargain away the atmosphere we breathe, and pass to the auctioneer, to be sold without reserve to the highest bidder, the water we drink; let the solid earth itself tremble and pass away in thin air, and our lives will be quite as hopeful as when vegetation forgets its office, and the plants of the forests and the fields cease to minister to our necessities. They furnish us, directly or indirectly, with all our food, our clothing, our fuel, the greater part of our building material, the white sheets upon which we write; they extract the poisons from the air and render it fit for our use, and they pump up the water from the earth and send it down the valleys in cooling streams to give drink to the thirsty. "Were I a heathen, not knowing the true God, I would not worship the sun, as did the Peruvians, nor the stars, as did the nations of the East, but would bow in adoration to the trees and herbs of the field." Why not, in the absence of the knowledge of a higher power, worship that which provides my wants and pours out its many luxuries to meet my desires—by which or through which we may almost say we live and move and have our being?

But, in the beginning, man was given dominion over the sea and over the land, and all things contained therein. "God said, Behold, I have given you every herb bearing seed which is upon the face of all the earth, and every tree in the which is the fruit of a tree yielding seed; to you it shall be for meat." Like every other gift of the Creator, however, they are ours to improve. He always gives us elements from which we must develop their possibilities. He furnishes the materials; we, by patient study and consummate skill, must learn how to use them. He gives us organs of speech, but long and careful training alone renders the human voice vocal with song and stirring with eloquence. He bids the wild lightning exhibit its terrible speed and power in the sky, but the labors of a Franklin and a Morse were needed to make it tamely and obediently comply with the dictates of man. So the original potato was planted in the soils of Peru, a somewhat bitter, scarcely edible product, from which the world-renowned vegetable has been propagated through the agency of man. The diminutive original of the cabbage, growing wild upon the shores of Old England, without a sign to hazard a prediction of its after-value, has gathered up its juicy leaves under the fostering influences of culture, and now yields, far and wide over the surface of the earth, its highly prized substance. As it were but yesterday, was developed a more wonderful product from the trees of tropical America and Asia. For ages the trees from which India Rubber and Gutta Percha are obtained, grew and flourished, yielded their products and perished, thus generation after generation of them passing away, before they became in the least serviceable to man. In 1770 Dr. Priestly refers to the rubber as a substance, which had just been brought to his notice as admirably suited for rubbing out pencil marks, and as selling at three shillings sterling—just about a dollar in our currency—for a cubical bit of half an inch, and the record of this first simple use we still have in the name—rubber from India, or India rubber. But it was not till 1839, only thirty years ago, that Mr. Goodyear, of New York, gave it to the world in its present protean form. To-day, to what myriads of uses it is put! Varnishes, paints, tubes, hose and pipes, shoes and clothing, railroad carriage springs, flexible joints, dishes, toys, combs, furniture, beds, tents, traveling bags, covering for submarine telegraph wires, etc., etc., an array of uses such as never fell to the lot of any vegetable product, woody fibre alone excepted. It was a Goodyear in more than one sense that gave to us a new substance of such rare value. The world can well afford to remember the name found stamped upon all these goods, and the time well known as the good-year in invention.

But let us look further. The hundreds of the varieties of wheat, both winter and spring, have, through man's agency, all sprung from one species. See the differences. There is the white chaff, and red chaff, the bearded and bald, the early and late, the strong wiry stems and the soft and flexible, the large grain and the small, the dense compact head and the long loose one, the varieties liable to rust and others subject to the attack of insects—yet all were created alike. It is said that all the varieties of the rose came from fourteen species, every one of which had single flowers, and very little fragrance. Behold again the dominion of man in the petals of the rose. The apple, of which there are estimated 1000 varieties cultivated in the United States, are all from one plant—the apparently worthless European crab. The 200 varieties of peaches likewise originated from one species in Persia, their differences wholly due to causes exterior to themselves.

All these illustrations, taken at random from the innumerable number that present themselves upon every hand are a kind of bird's eye view of the undisputed dominion of man over the forms of the vegetable world. They clearly show us that long culture and well directed care completely and radically changes, so far as their value is concerned, the elementary vegetable forms which the Creator in the beginning planted upon the earth.

The particular methods of producing desirable changes must be in the main passed by in this paper, having been so fully and ably discussed in other parts of this lecture course. Some of them are brought about by simply making the conditions under which growth takes place, more favorable, and is only a change in degree, not in kind, while others consist in interrupting the natural functions and producing vegetable monstrosities. The primary aim and end of all plants is the production of seed by which its species may be perpetuated. It is for this the vine, by spiral coils, lifts itself above the damp earth into the life-giving sunlight; it is for this the oak strikes its roots deep into the earth and spreads out its ponderous branches bearing their immense load of leaves. Now, if the seed is the valuable product, as it is in wheat, corn, and beans, we must strive to increase the natural development of the plant, to furnish it an abundance of proper food, to assist it in every way in its natural career; but to develop extraordinarily any other part of the plant, we must resort to checks, to local stimulations, crosses, modified influences in the circulation of sap and assimilation of food. Nearly all of our orchard and garden fruits belong to this class, hence the necessity of pruning, grafting, hybridizing, etiolating, and the like, all processes well known to our practical fruit growers and gardeners. It is the juicy pulp of the apple, the melon, and the gooseberry that we value so highly, but this is never produced to a great extent by the plant in its natural state, and it is here that man has achieved some of his greatest triumphs over the vital forms which it has been given him to control. He has given the tints and fragrance to the rose, the nectarine juices to the fruits, the starchy fatness to the roots and subterranean stems, has made the barren fruitful, and the waste tissues to lean with the fullness and richness of their products.

It must not be supposed, however, that man's dominion over nature is not limited, and that because he is made a ruler, he is therefore an absolute monarch over his passive vegetable subjects, for in his authority he is, and must eternally be, governed by a constitution and by-laws, written out by the finger of the common author of both. Some plants utterly refuse to give up to the will of man any of their time-honored characteristics. The wheat seems perfectly willing when properly appealed to, to dispense with the awns or beards which tassel its head; but the rye, equally ancient in origin, persistently holds to them. The potato gives up its bitter, somewhat poisonous properties, and humbly but richly ministers to our needs. The cabbage forgets its ancient worthlessness; but the dog-fennel persists in being simply and senselessly, it seems, dog-fennel still. Indeed, this is the case with most of our noxious weeds.

The technical name given to this disposition to change, under culture, is *sporting*, and plants that may be thus modified are said to sport; but there seems to be no sport about the thorn and thistle which sprang up under the curse of the Almighty.

But even with those most obedient to man there is a limit beyond which they never go. Some eternal proclamation had been issued to them long before man had an existence, saying, "thus far shalt thou go, and no further," and the command, written in the secrets of their internal structure has come down with them through the ages, and must go with them to the end of time. The rose, though bearing its thorn, never becomes a thistle, the apple never gives up its individuality and assumes that of the peach or the pear, and, though hundreds of voices and pages of testimony to the contrary notwithstanding, wheat never becomes chess or cheat, as it is sometimes called. Not that experiment has alone proved this fact, but that the fundamental law of its existence forbids it.

Different varieties, species and even genera may be grown together in such a manner that the new plant, called a hybrid, shall partake of the characteristics of both. Many flowers hot-house, and garden plants are thus originated and seemingly new species established but all such plants are unstable in nature and exhibit a constant tendency to revert back to the primary forms. But the principle has its uses. From flowers of different colors is produced, one having both tints becoming what we call variegated. In the same way fruits and the other vegetable products are modified. A knowledge of the fact will also teach us to avoid such results as are not desirable. Plants of the same nature must be grown so far apart that the pollen grains, that fine dust from the centre of the flower, from the one shall not reach the other. All must have observed how corn of different varieties planted side by side mixes upon the ear. The powdery dust from the tassel of one variety falls upon or is carried by the winds to the silk of the other. This latter consists of hollow tubes, each one of which connects a rudiment, any kernel with the outer world. The pollen grain falling upon this outward end, bursts its spherical covering and stretching out its inner integument to accommodate itself to its task, descends the long silken channel and by its union with the embryo grain prepares the way for the fully developed kernel, having the color, size, etc., of one or the other of the varieties. But without this union nothing is formed but the worthless, watery sac which we sometimes find upon the cob. In some plants when useful products are thus obtained the varieties are perpetuated by cuttings, and grafts, but the seed if any are produced which is not always the case soon give plants possessing the characteristics of one or the other original kinds.

Another element in plant growth already spoken of in this course of lectures which contrary to the prevailing opinion undoubtedly baffles the power of man. It seems to be a common belief that plants coming from warmer regions, may by continued growth, become adapted to our more vigorous climate. Instances are cited of plants which were grown only in hot-houses, at first and afterward found to succeed in the open air, but it should be remembered that though coming from a warmer latitude, they may not require more heat, and that had they been tried first, would have succeeded just as well. Plants growing under a tropical sun may still be alpine in character from the altitude they occupy. A plant from Southern Africa was introduced into England some years ago and found to succeed only under cover of the hot-house, but a specimen was accidentally thrown into a garden pond and continued to thrive very vigorously. The result did not, as was thought, prove that the plant had become acclimated but simply that its roots had penetrated deep into the water which was fed by springs. From the testimony of many closely observers it appears that each kind of plants bears a certain range of temperature, the limits of which cannot be extended by man. Varieties certainly may be secured better suited to the climate, but always at the hazard of losing the valuable properties of the original for which alone we care for its permanence.

But with all the changes man has wrought in the vegetable world he has still an infinite task before him in the same direction. The number of plants which now directly furnish us with food or clothing are but a few hundred, while the total number of known species of plants, to say nothing of varieties, amount in all to more than 120,000. Who believes we have found out all their useful properties, or have realized of all their highest possible development? What has been done, and especially in the last few years, forbids such a belief. Something like a century and a half ago a man by the name of Herd found a peculiar kind of grass growing in the swampy lands of New Hampshire. He procured the seed and began cultivating it for hay, for which we were told last week the grass stands eminently foremost in the order of plants first in value to man. Out in the valleys of the Rocky Mountains grows wild a kindred species of the same grass softer in texture, not tending so strongly to the formation of woody fiber, and apparently better adapted by its thick growth of base leaves for pasturage. Who knows but our valuable timothy or Herd's grass is to be surpassed by this rival brother? Growing along with it is a species of flax, having apparently all the valuable properties of our field product, and of nearly double the size. Who, again, shall predict what shall be the future of this plant, and of the tens of thousands yet to be brought into use? Who shall teach us to more successfully manage those we already have in improving their fruits, in avoiding or curing their diseases, in discovering new economical and medical uses? This is the final application of the knowledge received in the study of botany. This is the goal to be reached toward which the science is continually pointing. Like the diamond it is treasuring up the light gathered from the pointed spires of leaves and shining through irradiated cell structures, and is pouring it in burning lustre upon the pathway of our investigations.

Professor Chadbourne says to accomplish all we wish and all we expect in bring the vegetable world to render its riches more abundantly, we must undoubtedly call to our aid the kindred science of chemistry. But here is the great storehouse of materials. * * * * All animals, man included, are so constituted that they cannot subsist upon inorganic elements. We may analyse our food, determine its exact composition, but it will not enable us to feed on minerals. We may prove with all the science of a Liebeg that charcoal and air, and water contain all we need, but we know they would form poor fare for our tables. We may call in the aid of chemistry, with all its power, to produce transformations—give it a magazine of the pure elements, and it cannot furnish us with a single grain of starch nor crystal of sugar, nor anything to be a substitute for them. The plants are the only chemists that can take up these inorganic materials, and in the wonderful laboratory of their living tissues mould them into forms to support animal life. * * * * We can hardly over estimate the importance to our country if all our young men who travel were so vested in science that they should be able at once to detect the valuable properties of plants and their habits, that all capable of introduction might be secured at once. A single plant might repay for all the time and labor of every American student in this department. But if men are never trained they do not observe, and if a strange plant is forced upon their attention they know so little that they can determine nothing of the prospect of improving its qualities by cultivation if ever of cultivating at all. If all those who labor among plants, and have opportunities of introducing new, were well versed in botany as it is now understood, this source of wealth would be vastly increased in a single year. The progress would be rapid. The quality would be improved, and the number would be increased. Useful plants would take the place of those useless or noxious. Our forests would be better preserved, and new forests would be springing up. Millions of acres, barren and dreary, might be gradually supplying our waste trees, if men would learn that forests can be planted, and were imbued with that spirit of improvement and care for coming generations which science has ever had a tendency to produce.

It may be said, with truth, that much of the work already done has been done by those ignorant of science. These results have been the slow accumulation of the ages; we wish now more rapid progress. The times demand it. The same is true of every department of human industry and source of wealth. Discoveries in olden time were accidental. The alchemists, in the dark ages, with their alembics and crucibles and chemicals of mystic names, worked by chance, and by chance, from time to time, made some valuable discoveries. But how different is the work of a modern chemist! A thing is to be done, and he is able at once to bring to bear upon the problem all the principles of that wonderful science. Every experiment is performed for a definite purpose, and accidental discovery is the exception, not the rule. So in mechanics—a result is to be reached, and the problem is attempted by well established principles. Those wonderful looms that ply their iron fingers to weave our carpets, were not a chance discovery by Bigelow; they were an invention, reached only by long-continued, systematic study. So of the discoveries and the improvements in the vegetable kingdom in our day. They must not be left to chance, but be sought under the guidance of science, where alone the course is direct, the progress sure and rapid.

We have attempted thus far to indicate the importance to us all, and especially to the agriculturist and horticulturists, of the study for which we are contending. Let the attention now be turned to some of the special lessons which it teaches. Like every other science, its first great work is to classify and give names. History shows that this has been the chief work in the past; and, it may be added, in no department has there been greater problems to solve, or greater triumphs achieved. What wonder that, with 120,000 species in their multiplied forms, the task has been long in its accomplishment and herculanean in its requirements. From the days of Solomon to the present time, earnest men have been contributing their industry, their investigations and their talents to this one end. System after system has been advanced, zealously advocated, thoroughly tested, and abandoned, to be superseded by another, destined to share a similar fate. Thus the work went on, groping in the darkness, but struggling for the light. At last, about the year 1682, a luminous *Ray*—a man by that name—came to the aid of the investigators, and the foundation of our present classification was laid. Let us not imagine, however, that this preliminary work was done in vain. To form any valuable classification, a very extensive knowledge of the kinds, structure and habits of plants was absolutely essential. This knowledge obtained by the rivalries of original and diverse plans became the building materials from which the goodly structure has now been reared. But man has found that it is not his business to invent schemes of classification, the work having been done in the beginning of time. He is but to read in reverence the handwriting of the Almighty. The seals of the book of nature have been broken, and the broad, glittering page with its exquisite touches of beauty, and wonderful revelations, spreads out everywhere to those who will read the story of the creation. It is true that we do not yet always interpret correctly, neither can we expect to till our knowledge of the vegetable world is complete and perfect; but enough is already known to make our progress in this direction sure, and to give us a clear insight into the mysterious works of their infinite author.

The differences which we observe in plants have been caused in one of two ways. Either all forms were created alike, and have, by insensible shadings due to kinds of food and other external influence, gradually changed in character, so that in one instance we have an oak, and in another a pine; or they were created different, and have, by constant reproduction of themselves, remained true, except in slight variations, to their original types. Common observation always points to the latter, but is it not strange that scientific men are divided upon the question, and are to-day waging war upon each other in hot debate and severe criticism. But let the matter be settled as it may, the lasting value of our classification depends upon the idea that species are permanent vital forms, absolutely unchanging in time beyond a certain limit, and recognized everywhere as belonging to the same family of individuals.

A species may be defined as the entire collection of plants of one kind that have descended from the same parent stock. They will therefore, agree in all essential particulars. The properties of one are the properties of the whole. And so we find it in nature. A single plant is found to be poisonous. and immediately we conclude that every other plant of the same essential character is also poison, if one is found to have strong fibrous bark, its kind may be examined everywhere, though continents intervene, and find the same peculiarity. Species then, are the true subjects of classifications, but the work does not end with them. While they are separated from each other by clear and definite distinctions, several of them are found to exhibit striking resemblances to each other as if originally modeled upon the same plan. Thus we arrive at the idea of a *genus* which is a collection of allied species. Again upon still broader natural characteristics, genera are grouped into *orders*, these in turn into *classes*, the classes into *sub-kingdoms*, or the primary divisions of the kingdom of plants.

The work of making out a classification, has however in the main, been accomplished. We can hope for but little more in this direction. It now remains for us as students of nature to use it, to assign upon examination, the various plants about us to their proper places in the system. To do this will require an intimate knowledge of the structure, forms and habits of every specimen we examine. We are not only led, but compelled to observe closely. We must watch the tiny seedling just bursting from the earth and follow it carefully in its processes of flowering and fruiting; we must dissect its parts, and with microscopic vision, note its structure; we must, by the taste or chemical tests, find out its properties, and seek to pry into the mysteries of its life.

The system of classification, therefore, not only hangs out as it were a label upon each plant, as a true guide to the knowledge of its whole species; but stimulates thorough investigation into the structure and life of plants. This brings us to the province of Physiological Botany, in which the great work of our day is to be done. Here are mighty problems yet to be solved, respecting the conditions of growth, the direct food of plants, the influence of sun-light and heat, the means of securing more bountiful harvest, the modes of increasing new varieties, the finding out of new uses for those we have, and the general influence of vegetation upon the economy of nature.—But so much has already been said upon these topics and to be said under special heads hereafter, that they are in this paper omitted, save one statement from Dr. Sewall in regard to the influence of vegetation upon climate. He says:

"Tell us how much water the leaves pump up. Let me say here, I do not mean the water that evaporates from the leaf, as it would from a wet shaving, but how much it actually pumps up. It has been demonstrated that every square inch of leaf lifts three five-hundredths of an ounce every twenty-four hours. Now a large forest tree has about five acres of foliage, or six million, two hundred and seventy-two thousand, six hundred and forty (6,372,640) square inches! This being multiplied by three five-hundredths (the amount pumped up by every inch) gives as a result, two thousand, three hundred and fifty-two ounces, or eleven hundred and seventy-six quarts, or two hundred and ninety-four gallons or eight barrels; a medium sized forest tree, about five barrels; the trees on an acre, eight hundred barrels in twenty-four hours. An acre of grass or clover or grain would yield about the same result.

I have made a calculation of the amount of water lifted from the great Amazon valley. * * * Here is the result of my arithmetic, 974,328,972,628 barrels, 23 gallons, three quarts, one pint and a fraction. I suppose a professor of mathematics would have told us the exact fraction, but this is near enough perhaps.

The great treeless plains are rainless, except when a foreign shower visits them. On the Plateau of Bolivia it never rains, except when the great Amazon Valley sends up its surplus waters over the Eastern Andes. The vast desert plains of the West, afford another illustration of this fact. Regions cleared of forests are always drier, the streams smaller, the rains less frequent. Not only does the leaf pump up water but all the inorganic matter. The mineral matter of the earth dissolved by and in the water, is lifted into the tree, and the water is lifted into the tree, and the water evaporating leaves the mineral or ash in the wood. Now the ash in the oak tree amounts to three per cent of the entire weight. A large tree weighs seven or eight tons, an ordinary medium sized forest tree, weighs five tons; in such a tree, the leaf has lifted three hundred pounds of solid earth. Surely, the leaf has an elevating influence; it brings earth nearer heaven!

A new field of labor is also opening before the student of botany, that of the vegetable diseases. Perhaps nothing pertaining to plants is so little understood; but the importance of the study and the increased facilities of late years for microscopic observations will undoubtedly call more attention to the subject. Cold, damp soils, sudden changes in temperature, excessive heat and drought, the attacks of insects and parasitic plants are among the fruitful sources of disease. So far as observation has gone, it is pretty generally believed that the parasitic fungi are not in the first instance a predisposing cause of disease or decay; but it is known that they materially influence both, after causing great loss and alarming destruction. The spores or germinating particles of these plants are so minute, that they readily float invisible to the eye in the air, and being very tenacious of life, await with perfect composure a favorable opportunity to germinate and grow, which they do with astonishing rapidity. Doubtless, all have observed upon wet days a jelly-like formation on old leaves, decaying wood, and other substances. In some cases this forms so fast that it is popularly believed to have fallen from the clouds. A gentleman in Australia was, when ascending a hill, overtaken by a sudden shower, and upon his return, found the hill-side so slippery by this fungus or algoid growth, as to render his descent in safety quite hazardous. We are often astonished at the rapidity with which fields of wheat are attacked by rust, the value of the crop sometimes being totally destroyed. This is caused by a fungus called Uredo Rubigo. It forms yellow and brown oval spots and blotches upon the stem-leaf and chaff. The spores burst through the epidermis, and are dispersed as very minute grains. Henslow has shown by experiment, that if the diseased seeds of wheat be steeped in a solution of sulphate of copper, they will not produce diseased grain, and that the sulphate of copper does no injury to their germination. The solution used is one ounce of the sulphate of copper to a gallon of water for every bushel of wheat." It is believed that the spores are contained in the seed from the disease of the previous year, and that should the plant meet with nothing to prevent its vigorous growth they would never be developed, but are ready at any time to seize upon their victims if a favorable opportunity presents itself.

As a rule fungi are never found upon perfectly healthy surfaces. "Mildew is a disease caused by a fungus denominated *Puccinia graminis.* The ripe spores-cases of this plant are small dark-brown-club-shaped bodies, their thicker end being divided into two chambers, each filled with minute spores, and their lower end tapering into a fine stalk. The clusters of spore-cases sometimes burst through the epidermis, or skin of the plant, in vast numbers. The minute spores seem to enter the plant by the stomata—or air openings in the leaf. In the vine a kind of mildew is traced by Berkely to the attack of a fungus called Oidium Tuckeri. For this disease sulphur and the pentasulphide of calcium have been recommended as remedies. Smut spurred rye, the potato disease, the rotting of fruits, and the decay of wood, are all with many other vegetable diseases believed to be the result of fungus plants. Ring-worm, in our bodies, according to Dr. Fox, is produced by the spore of the fungus which causes the disease, getting into the hair follicle, reaching the root and being carried up into the body of the hair. Intermittent and miasmatic fevers are now believed to be due to the same forms of vitalized beings.

But there is still another element in this study of botany of direct bearing upon our agricultural and other rural pursuits. We are all ready to admit the importance of these avocations. We hear them lauded in surrounding terms in public addresses. Their praises are upon the lips of many at our agricultural fairs, and in theory we all agree with the wise man known to all, who said: "Agriculture is the noblest pursuit of man." But much as we believe in all this, and much as we desire to cherish such a feeling, among men knowing that the nation's wealth depends upon it, what do we really find in practical life to-day right here in the shadow of our university. Go yonder in the towns and country round about, and inquire of the young men what they propose to make the business of their lives, and listen to their replies. Hear them talk of law, and medicines, of trades, of civil-engineering, of getting an education with a vague idea of being able to do something afterward, while a few out of the many choose the farmer's life. With parents it is not quite so one-sided, but after all, how many among those who labor themselves, are there that would not rather have their son become an eminent lawyer, or a wealthy merchant? Now this should not and need not be.

It is not because these occupations are not healthful, for the testimony of all time is to the contrary; it is not because they are not honorable, for among all the pursuits of man they are the most legitimate; it is not because they do not pay, for with proper culture nothing offers greater inducements in this respect than our rich prairies; it is not because the labor is greater, for men are every day leaving them for more laborious and harrassing pursuits; it is and must be because the brain is not called into action as well as the muscle of the arm. Let a man have the opportunity of engaging in a pursuit which obliges him to think, and he will not dig potatoes for you with a hoe for the same price. The engineer will clear the way and mark the route with excessive toil for a railroad, but will scorn the offer of more money, if such should be the case, for shoveling sand, though his hands are equally soiled and his cheek equally bronzed. The pickaxe becomes a very different instrument in the hand of a geologist from what it is in the hand of the common stone-quarrier. We do not say that farming and orchardizing do not require thought, far from it, for they do require and are receiving the closest thought of many of our ablest minds, and in our day more than ever before; but the curse of the employments is, that the large mass of those now engaged in them, who are thus searching after other means of making a living, are never trained to think. Things grow up around them in obedience to some unknown law, over which, they imagine, if it even occurs to them at all, they have no control. They do not and cannot see the need, nor the opportunity, of exercising so much brain power, and, to them, mysterious learning. But let the light of that learning shine in upon them, that they may see, there is a reason within their comprehension for almost every change that takes place about them, from the growing and pointing of a leaf to the prolonged drouths of summer—not a mere matter of guess work, founded upon speculation, but resting upon the broad foundation of undeniable truth, and we shall find these pursuits in practice where—as they ought to be—we now know them in theory, and as they are represented in our high-toned, public-spirited addresses.

Now, the teachings and problems of Botany, in its broadest sense, embracing every possible scientific inquiry about plants, whether of the forests, the grasses, the fruits, or of the microscopic forms which infest the earth, the air and the water, will furnish him who lives among and by the products of the vegetable world, an exhaustless source of pleasurable and profitable investigation, of close inquiry and of deeply-penetrating, far-reaching, wide-comprehending power of though.

May the time speedily come when this University—not by teaching one science alone, but all the departments of learning pertaining to the industrial pursuits of man—shall infuse into the very life blood of these callings this inspiring, manhood developing power. Then shall the best interests of agriculture, horticulture and the mechanic arts be most enhanced, but not these only, for man himself will rise as man and be crowned with power and dominion above them all.

ANATOMY, PHYSIOLOGY AND ECONOMY OF PLANTS.

A Lecture by John H. Tice, Recording Secretary of the Missouri State Board of Agriculture, delivered at the Illinois Industrial University, Jan. 21, 1868.

The subject selected is vast in proportions and comprehensive in extent. So vast and comprehensive, indeed, as almost to preclude the possibility of giving, in a single lecture, an intelligible statement of even one of its three subdivisions, much less of its whole. You must not, therefore, feel disappointed, if many of the points that will loom up in the discussion, will not be presented in all their minute details. Time and the occasion necessarily restrict us to the discussion only of general principles.

Plants in the order of creation preceded animals; and in the order of habitation and settlement of the earth's surface, always precede or accompany them. The limits of inhabitation, for either man or animals, are, therefore, inexorably fixed by the limits of vegetable growth. Why are the deserts of Central Asia, and the Great Sahara of Africa, uninhabited by animals? Because no vegetation is there to sustain animal life. And, if ever they will be inhabited, or inhabitable, it will be when man, in the progression of the arts and sciences, will acquire the knowlege and skill to make vegetation grow and flourish there. Plants are the connecting link between the animal and the mineral world. Animals cannot live on inorganic matter. Exposed where only surrounded by minerals, they must perish; because they have no power to assimilate them, and therefore no ability of being nourished by them. But plants fixed by their roots to the earth, decompose by galvanic action mineral substances found there, and absorb what is their proper food; which, under the influence of light and air, is converted into different vegetable compounds, serving for the food of animals. Then come animals, and feed upon the organized matter that plants have elaborated from the soil and air.

But, if animal life depended solely for subsistence on the vegetation spontaneously produced, the earth would not nourish and sustain one millionth part of the animals it is capable of sustaining. Hence human skill and science are necessary to take control of vegetable life; and to so direct it as to contribute to the utmost extent to the multiplication and sustenance of animal life.

Man has availed himself largely of the forces of nature, and after subjecting them under his control, has directed them mechanically to subserve the purposes of life. In the great future, he will avail himself to a still greater extent of them; and by them will effect purposes not now even dreamed of. But how has he availed himself of cosmical forces to carry on his mechanical operations? By studying their nature, and ascertaining the laws that operate through and by them.

What was true in the employment of wind, water, steam, electricity, magnetism, or any other force used by man as a motive power, is true, and must be complied with, to avail himself of any other forces laid up in the great magazine of nature, for his use whenever he has demands for them. And since the primary dependence of all animal life, either for multiplication, extension or sustention, is on an abundant supply of vegetable productions, the study of the anatomy, physiology and economy of plants, is one of primary importance. For man cannot control and direct to the attainment of the highest results, vegetable life, unless he knows the laws by which, and the conditions under which it operates. I shall, therefore, treat as briefly as is compatible with intelligibility, the subject under the following three heads:

Firstly—Vegetable anatomy, by which I mean the analysis of the body of the plants, so as to determine its organs and general structure.

Secondly—Vegetable physiology, or a description of the functions of the different parts or organs of a plant, and the offices they perform in its individual economy.

Thirdly—Vegetable economy, or the regular operations of nature in the generation, nutrition and preservation of plants.

I. VEGETABLE ANATOMY.

Every plant, or animal, originates from a single primary cell. Anatomically a cell means a little sack or bladder, filled with fluid. As organic cells are so extremely minute as generally to be invisible to the natural eye, that you may comprehend what is meant by the term cell, I will state, that the compartments of a honey-comb are called cells. Similar are the cells in organic tissue, only they are closed on all sides. If a minute particle of wood is shaved off and placed under a powerful microscope, it is found to be honey-combed with cells. They are so small that in a cubic inch of wood there are often one and a half millions of cells. Whatever the form or size of an animal or tree, it is all evolved by germination of a single cell. Each cell, though not differing externally in size or form from thousands of others, yet is so governed in its budding by a *sui generis* law, that it always evolves and reproduces the form and symmetry of its parental type. Men have sought grandeur, the beautiful, wonderful and sublime in scenes where nature operated on a grand scale, producing an Andes or a Niagara; yet what are the Andes but an amorphous pile of matter passively upheaved by a subterranean force? And what is Niagara, but a passive mass of liquid matter obeying the cosmical force of gravity, and tumbling over a precipice? How does either compare, in the wonderful, with a little cell filled with a vital fluid which buds in regular order into other cells, in such places, and in such numbers as in time to evolve in all its beauty and loveliness the original parental type.

The substance constituting the cell walls is called *Cellulose.* It is composed of the same elements and in the same proportions as starch. Starch, indeed seems to be the primary substance out of which all the cellulose group are formed. Starch, cellulose, Inulin, Dextrine, Bassorin, Vegetable mucilage, and Metarabic acid, are isomeric bodies; that is, they are identical in composition though different in properties. Their composition is expressed by the chemical formula, C 12, H 20, O 10. In starch we have three, and the most important three elements, as far as quantity is concerned, out of which plants are constructed. All the ternary compounds, such as gum, jelly, cane and grape sugar, oil, resin, wax, tanin, etc., are compounds of various proportions of these three elements. The fourth element is nitrogen. It forms quaternary compounds, in which the four elements are combined in various proportions. Later analyses have shown that most of these bodies are not purely quaternary, but quinary compounds. The fifth element is sulphur. Albumen, which is transmuted starch, seems to be the basis of these compounds, as starch is immediately of the cellulose group. The white of an egg is the familiar form of albumen. From it spring the albuminoids, such as fibrin, casein, gluten, gliadin, mucedin, etc. The albuminoids are sometimes called protein compounds; the term protein, in Greek, signifies to take the first place, or the highest rank, and was adopted to show their physiological importance in the structure of bodies. It must, however, be borne in mind, that all these bodies are merely the advanced stages towards growth and nutrition, and are only starch transformed by the action of plant life.

But proteine, when found in the cells, has received the name of protoplasm, meaning first formed. It lines the inner walls of the cell, but does not fill it, and apparently is the active agent of transforming the other contents of the cell into organizable matter.

Protoplasm, or the formative substance, is a granular, gummy, azotised fluid, found gathered around the nucleus, or cytoblast, of the cell, and its walls. It does not mingle with the other fluid contents of the cell, but possesses a visible stream-like motion, flowing upwards and downwards through them within the cell. The fluids proper of the cell apparently remain passive, while the protoplasm, in transposing the elements present in the cell, is constantly undergoing changes. If the motion were not life itself, or rather the evidences of life, we might conclude that it originated and depended upon the reciprocal action of the chemical elements of the fluid. It unquestionably is vital action, and may be sustained by the chemical, or perhaps galvanic action, reciprocally of the nucleus (that is cytoblast) and the cellular integument; since the spiral current is always *from* the cytoblast to the cell wall, and returning *from* the latter *to* the former, the nucleus, in other words, is the centre of the motion.

THE CYTOBLAST.

The nucleus or cytoblast, is a round, but sometimes also oblong, and generally flat, small body, with a sharp edged circumference occupying the centre of the cell. Mostly it is as transparent as water, filled with a very minutely granulated substance. In time, within the cytoblast may appear one or more nucleoli, or minute cytoblasts. New cytoblasts, for future cells, are formed either independently, or by division. When formed independently, it seems to proceed from the protoplasm manifesting itself as a nucleoli, around which soon an integument forms. When the multiplication is by division, the original round cytoblast elongates, and soon a segmentation takes place, and instead of one, two nucleoli appear. In the division of the mother cytoblast, the protoplasm plays an important part.

FORMATION OF CELLULOSE.

We now know what an organized cell is, and how it multiplies the nuclei for the formation of new cells. We have already seen that the integument of a cell is cellulose; and cellulose, by chemical analysis, is found to be identical in composition with starch. In the point of appearance, the albuminoids and all the protein compounds, stand between it and starch. It therefore has passed through all the intervening metamorphoses.

Cellulose is now generally supposed to arise from the outer hardening of the protoplasm. Its subsequent thickening is formed by alternate layers of hardening protoplasm; and its alteration is supposed to be due to the chemical, perhaps galvanic action of the protoplasm and elements present in the cell.

The formation of new cells always proceeds from the interior of an already existing one. The cell in which a new one is formed is called the mother cell, and the new ones, in relation to each other, are called sisters, but in relation to the mother cell are called daughters. When but a portion of the contents of a mother cell is consumed in producing new ones, it is called free cell formation; but, on the other hand, when the whole contents of the mother cell divides into many parts, and a cell springs from each subdivision, it is called cell-production by division. In both cases the cytoblast is formed first, and a new cell then incloses it. By free cell-formation, the mother cell endures as a permanent part of the structure; but when cell formation proceeds from division, the mother cell vanishes, its integument sooner or later dissolves, and is consumed in forming cell membranes for the daughters. This latter species of cell formation is universal as to grains of pollen, and the sporangia of the cryptogamia.

GROWTH AND NOURISHMENT OF CELL MEMBRANES.

The original form of a young cell is subject to many transformations by the mode of its nourishment, for, naturally, with the growth of the contents, the cell-membrane grows also. When the cell extends itself equally in all directions, it acquires size without changing its original form. On the contrary, when it extends itself more in one direction than others, or if certain points on its periphery extend themselves predominantly, with its increasing size, it also changes its primitive form; and the diversified forms in which cells exist accord with the manner in which the cell-membranes extended themselves. The growth of a cell is, however, often restricted in its freedom by neighboring cells. Its form then more or less subordinates itself to the existing cells. This is the case in all those tissues where the cells are compactly placed. The thickening of the walls, and the finally closing up of the cells is effected by the continual deposition of cellulose layers upon the inside of the membrane. The inmost layer is, therefore, always the youngest.

COMBINATION OF CELLS.

In only a comparatively few cases does a plant exist of a single cell: only in some fungi and algae. On the contrary, in the higher plants, the structure is a combination of several varieties of cells.

Cells can be classified into like and unlike. When like cells are united, we call the combination cellular tissue. But when unlike cells are united, we call the combination vascular tissue. Cellular tissue can be subdivided into wood tissue, bark tissue, bast, pith, foliage, etc.

The compound known under the general name, parenchyma, is understood to apply only to the cellular tissue, as developed in the bark, pith, leaves, etc. By the vascular tissue is meant the combination of cells that are much, and sometimes indefinitely, elongated, and should properly be called ducts, such as convey the lactex or milky juice in the milkworts, the resins in coniferae, etc. They are of varied structure, annular, spiral, cylindrical, etc. The cellular and vascular tissues are each united together by an intercellular substance, which is a transmuted product of the mother cell, and is the same as that which, on the surface of plants, is called cuticle or epidermis.

INTERCELLULAR SPACES.

Where the cells lie side by side, without being in contact at all points, there is a free space which is called an intercellular space. The more globular the cells, the smaller will be the superficial points of contact, and the larger the intercellular spaces, and also the more will the form of one cell be subordinated to another; and the more the walls mutually flatten each other, and the closer they lie side by side, the larger become the superficial points of contact, and the smaller the intercellular spaces. The tissue formed of stellar shaped cells, therefore, has the greater intercellular spaces. These spaces generally are filled with air, and form in this wise a regular tissue of a more or less coherent system of intercellular passages, which discharge in larger air-filled spaces under the stomata or small orifices, also called breathing-pores, in the leaves, or on the green bark of the stem.

In all tissue, while the cell-forming process continues, air is not found in the intercellular spaces; and in wood tissue the spaces are generally filled with the intercellular substance. But in those plants containing gum, resin, lactex, etc., the intercellular spaces are large and serve as ducts for these substances.

KINDS OF CELLS.

Cells can be divided into several distinct classes, according to their origin, the time of their appearance in the structure, as well as to their physical and physiological nature. The first general division is into free, and the second into combined cells.

To free cells belong the spores of the cryptogamia, and the pollen cells of the phænogamia.

To the combined or linked cells belong those named as constituting the different kinds of tissue already described, All cells that constitute an integral part of any structure, either of entire plants, are combined cells, as fungi, lichens, algæ, or parts of structure as wood, cambium, bark, bast, etc. In the building of vegetable structure the leagued, combined or linked cells, play the most conspicuous part. Of these the most widely distributed are the cells of the parenchyma.

PARENCHYMA.

The term parenchyma is applied to the substance constituting the cells of the pit, leaves, bark, medullary rays, etc. Parenchyma, like cellulose, is a mere transmuted production of starch. The cone, or apex, of any bud, whether of the seed, root, stem or axis, is always composed of it. Upon its presence depends the vitality of the bud; and consequently the life of the plant. Growth of a plant in whatever direction, upwards, downwards or laterally, is an extension of parenchyma. The vitality of the parenchyma, or its power of extension, depend upon the presence of vibrionic particles in the extending cell. Viewed under a microscope, these vibrios have the appearance of bees swarming, moving rapidly in all directions on the apex of the fluid contents of the cell.

Both in the longitudinal extension of either the extending or descending axis, the structure is parenchyma, known under the familiar name of pith. The lateral extension, originating *in* and radiating *from* the pith, is known as the medullary rays. The extension of the parenchyma thus produces the skeleton of the plant, on which all the other tissues form and build up its body. On the ascending axis nodes are formed, at which leaves develop, and generally a bud. The cells of the pith prepares the parenchyma for the development of the leaves, like those of the general structure do the cellulose for the cellular tissue. On the roots there is an analogous development, but no modes or buds for new roots, and none to correspond with the leaves on the stem, unless it be the rootlets. These sometimes have been called spongioles, but the term is now discarded by physiological botanists.

The cells of the medullary rays and those of the epidermis and bark belong to the parenchymatous group. The medullary rays are seen in the radiating lines from the pith, through a cross section of wood, especially of oak. The rays are formed of compressed and often closed cells, that keep up communication between the interior of the stem and the bark, from the pith outward.

The cambium occupies the intermediate space between the wood proper and the bark. It is the last year's deposit of woody fibre, filled with starch, and endures only until the next annual layer is forming. The primary cells of the cambium layer spring from the secretions of the medullary rays, which seem to act chemically on the elaborated element of transforming and fixing them as cambium in the descending sap. In the cambium of the stem and inner bark is the main storehouse of starch, and the azotized compounds for the use of the plant in the ensuing year. The cambium of the roots, and the roots generally, are richer in these compounds than the stem.

There is a distinction made between the cambium proper which is a compact cellular and vascular tissue, and the cambium ring (*annulus cambialis*) which is a more open structure. The cambium ring is formed early in the season, as soon as vegetation commences. When the parenchyma in the cone of the stem, or of the radicle, begins to extend itself by growth in spring, the medullary rays similarly extend themselves laterally, pushing out, as it were, the bark, and forming new cells of mucilaginous matter on the outer surface of last year's cam bium. It is on account of the delicacy of this structure that the bark so easily separates from the wood in spring and early summer.

The bark structure is not necessary to be analyzed at present. I will, however, mention that portion of the outer bark which has a green envelop. The green matter that gives it this color is chlorophyl, and is the same that gives color to the leaves. The meaning of chlorophyl is leaf-green. In the leaf, however, it is not the leaf proper that has this color, but is the coating of minute starch granules, fixed to the interior of the cells, or floating in their sap, that gives the leaf apparently this color. The cuticle or epidermis has breathing pores (stomata), both on the stem and on the underside of the leaves, which bring the interior structure of the plant into communication with the atmosphere.

LEAVES.

The complete leaf consists of the blade and its petiole or leaf-stalk. The leaf might almost be said to be a thin layer of green bark expanded horizontally. Like the stem, it consists of two distinct tissues; the cellular and the woody. The cellular is the soft pulpy portion, the parenchyma, and only appearing green because of the immense number of starch granules in it, covered with chlorophyl. The woody portion are the ribs or veins of the leaf, which, like the woody portion of the stem, give firmness to the structure. The subdivision of these veins are carried beyond the limits of unassisted vision, so as to distribute to and receive sap from the minutest organs of the leaf.

The cells of the epidermis both on the upper and lower side of the leaf are placed horizontally and are very minute, sometimes small parallelograms, and consist but of a single layer. The cells under the upper epidermis are compactly arranged and have their vertical diameter from three to five times greater than the horizontal. This layer consists of from two to four tiers of cells. Under and between these and the lower epidermis is a network of amorphous cells, arranged horizontally with large intercellular spaces. I have now enumerated some, not all, but the most prominent of vegetable cells and organs, have described generally their development and partly have indicated their function. The anatomy of the organic structure is now sufficient for our purpose. The organized plant is before us. It consist of two parts, the root and the stem. One forms nodes, out of which side branches may spring, and buds for continuing organic growth. The other forms no nodes, but new roots and rootlets spring from a peculiar development of the outer terminal cells of the medullary rays. The buds on the stem consist, however, of two kinds, the leaf or wood bud; and the flower fruit bud. From this I pass to the second division of the subject.

II. PHYSIOLOGY OF PLANTS.

The embryo of the future plant is nestled in the seed. The mother plant has stored in the end sufficient aliment ready prepared to sustain the plantlet in early life until it has acquired organs and vigor enough to take care of itself. Starch is the principal ingredient of the seed. But the embryo cannot digest starch until it is organized. Strong meat for men, but milk for babes, holds good also in the vegetable world. The mother plant has therefore digested a part of the starch in degree, and a part completely which latter is placed around the embryo so that when the plantlet wakes up, the food is within its reach. This is a introgeneous milk-like substance called aleurone. Next to the aleurone stands the alluminoids, and between the latter and starch stands the albumin. They are all starch in different stages or degrees of digestion. If the seed has one seed leaf only, it is said to belong to the monocotylidonous order of plants; if it has two lobes, to the dicotylidonous order. The function of the seed leaf is to act as digester of the starch until the store is exhausted and the plant organized. The embryo has two buds; and buds we have already seen consist of parenchymatous cells. The incipient development of these buds has received the name of germination. Warmth and moisture are necessary to germination. As a general thing fresh seeds germinate sooner and more freely than old. The seeds of many plants, if kept long, will soon pass the limits of germination. Coffee for instance. Some seeds like those of maple germinate as soon as favorable conditions supervene; others on the contrary lie sometime in the earth and generally do not germinate until the succeeding year. They seem to require time to become fully matured.

Germination is the commencement of cell formation at the apex of each bud of the embryo. One bud proceeds by pushing the ascending axis, the plumule, upward to put it in communication with the light and air; the other by thrusting the descending axis, the radicle, downward to put it in communication with the water and alkaline salts of the earth. The plumule soon expands its leaves in the air, draws in life and vigor from the vivifying rays of the sun, rejoicing in its new being. It is now ready to be weaned, and be self-supporting. What are its means to effect this end? It has exhausted its store of food laid up in the seed lobes; it must, therefore, draw it from other sources, or perish. Whence and how does it supply itself? These questions will be answered when we treat of vegetable economy. All we can do now is to give the functions of its different organs and the offices each performs in its individual economy.

ROOTS.

The roots we have seen puts the plant in communication with the earth. They may be divided into two classes: first, the primary or tap root which springs from the germinal cell of the embryo; and second, the secondary or side roots springing from the sides of the tap root. As there are no nodes in the root, consequently it does not develop like the stem, its branches from buds at the nodes. Branch roots, side roots, and rootlets can spring from the sides of any main root at any point whatever. Nodes in the roots would be an impediment to the economy of the plant; for then only branches and rootlets could spring from buds at the nodes. The plant requires an organ at all points when the soil comes in contact with the roots, to gather food which could not be the case, if rootlets had to spring from nodes. This peculiar development of rootlets, therefore, enables the plant to put forth any number of them desirable, which it often does so as to cover the main roots until it has a hairy appearance. The presence of parenchymatous cells is necessary for the development of branches either on the stem or root. On the stem, the branches are formed only at nodes where there is a ready organized bud; but the node itself is only a compact lateral development of parenchyma from the pith outward. The medulary rays we have seen are also a lateral development of parenchyma, permeating at all points and binding together the various tissues between the internodes of the stem. In the roots, these rays also bind the various tissues together and form a connecting link between the bark and the pith. Instead of a root branching out from a regularly formed bud as at a node on the stem, it springs from germination of the cell of a medullary ray. Something similar occurs on the stem when side limbs, known as water spouts, develop.

The medullary rays of roots, besides by germination multiplying roots and rootlets, may develop new stems; as is the case in the root sprouting of the locust, cherry plum and some roses.

Roots as a general thing shun the light; and burying themselves in the earth, they seek there such food as the plant requires from the soil. The main roots fix the plant firmly to the earth; and their extensive ramifications lay a considerable area of the surface tributary to the nourishment of the plant. The younger portions only of the roots perform the function of nutrition, and mainly by the innumerable fibrous rootlets they send out. These rootlets seldom, if ever branched, perish after performing their functions, but are constantly renewed.

CELLS.

The functions of the cells have already been partially indicated while describing their structure. First, cells may be regarded as digesters of the sap transforming it into cellulose and parinchyma for building up the skeleton of the organism, and for thickening and filling up the older cells to give stability and firmness to the structure. Secondly, they are general digesters of the reserve elements in the plant, and of the crude elements taken up by the roots. Though cells are closed sacks, filled with fluid contents, yet there is a constant interchange of elements between them. In a state of rust, the contents of the cells may be, and probably are homogeneous; but when vital action ensues, the transformation of the protoplasm into living organism, at such points where organic structure takes place, destroys the homogenity. This disturbs the equilibrium, and hence an interchange of elements ensues to replace those consumed in building new structure.

DUCTS.

The structure known as vascular tissue should properly be called ducts. It consists of indefinitely elongated cells, of which the function is to conduct the fluid and gaseous elements taken up by the roots to every active cell in any portion of the organism. Hence they are of unequal length. Between them and the cell there is a similar interchange of elements as between the cells themselves. They also furnish the water with whatever it holds in solution to the cells, and from the latter receive the digested sap. Crude elements and digested saps seem each to have their appropriate ducts in the vascular tissue.

SPACES.

Intercellular spaces, though devoid of air, while cell formation in their proximity is progressing, yet when the structure is completed form air passages throughout the organism. In the milk-worts these passages are filled with the lactex.

MEDULLARY RAYS.

The medullary rays branch off horizontally from the medullary sheath surrounding the pith. They keep up a communication laterally between the pith and the bark, and perhaps also with the atmosphere. The annular, or cambium ring, is formed in spring by their action on the cellulose. In the latter part of the growing season, their action transforms the descending sap into starch, storing it up as formed in the cambium and alburnum.

BAST TISSUE.

The bast tissue is composed of the longest cells found in any tissue. Textile fibres, such as hemp and flax, belong to this tissue. The membranes are tougher, softer and more flexible than the cells of the woody tissue. Their toughness is proportioned to the length of the cells, but when short they are brittle. Where long, as in flax and hemp, they have great tenacity. They are the main channels of the descending sap, and elaborate from it various alkaloids, most likely with the concurrent action of the medullary rays.

LEAVES.

Leaves have been termed the lungs of the plant. If intended as a comparison of the functions performed, it is unfortunate, because it would lead to the inference that there was an analogy between the offices performed by lungs of animals, and the leaves of plants; while, indeed, there is very little. Lungs bring the blood, and leaves bring the sap within the vitalizing influence of the atmosphere, and prepare them to build up vegetable and animal tissue. So far only the analogy holds good. But when we examine what takes place in the act of vitalization of each, we find it as opposite as the poles. In the lungs, the act of vitalization consists in the oxygenation of the blood; and the vital action in the animal organism ensuing therefrom decarbonizes organic matter to build up animal tissue. In the leaves vitalization consists of de-oxygenating inorganic matter in the sap, and the vital action ensuing in the vegetable organism carbonizes the inorganic compounds before building up organic vegetable tissue. Moreover, the lungs of an animal draw not a particle of nutriment from the air, while the leaves draw the greater portion of the nutriment for the plant from it. In the lungs the mixture of veinous blood and chyle, come in contact with the atmosphere, decomposing it, consuming the oxygen obtained, and exhaling the nitrogen and carbonic acid gas. In the leaves the digested sap decomposes the atmosphere, and the carbonic acid gas it holds in diffusion, consuming both the nitrogen and carbon obtained, and exhaling the oxygen. The leaf also decomposes water to obtain hydrogen which enters largely into the compound, elaborated sap. The dynamical effect, in the correlation and conservation of force, is also entirely different. The oxydation and decarbonization effected by animals, is the same as combustion, it liberates heat, while the deoxydation and carbonization effected by vegetation, imprisons heat. The analogy between the lungs and leaves, therefore, is very remote, and may be of use to assist us to understand the relative functions of each; but we must always bear in mind that is by antithesis and not by harmony that the relation exists.

The inspiration of the sap, also takes place in the leaves, first by exhalation of water, and secondly, by its decomposition and the absorption of the obtained hydrogen. The elaborated sap when it quits the leaves is, therefore, changed in its fluidity as well as chemical composition, suited to deposite in downward course, cambium, starch, gluten, alkaloids, etc.

III. VEGETABLE ECONOMY.

We have already seen that at the end of every stem, and at every node on it, there is a bud formed. These buds in the economy of the plant are either intended to perpetuate its life, or its species. The former are leaf, the latter flower buds. Flower buds only appear when the plant has attained or is approaching maturity. Diminution of nourishment or impaired vital action, is supposed to be favorable to the development of flower buds. In trees and shrubs the flower buds appear on spurs or beside the leaf bud. In herbs perishing annually, they supercede the leaf bud, or rather the latter is converted into a flower bud. The flower bud, therefore, is merely a leaf bud changed in form and function; and the leaves of the flower are but ordinary leaves changed in form and color. And as insects perform an important work in vegetable economy in distributing pollen, the leaves of the corola are colored for the purpose of guiding and attracting them.

STAMENS.

The stamens are only flower leaves that have still deviated farther from the normal leaf. In fact, they have deviated so far as to have lost the character of phænogamous leaves, and have acquired that of cryptogamous, by bearing sporangia. Stamens produce pollen, and if a pollen grain were self-proliferous, it would differ in nothing from the spord of a cryptogamia.

PISTIL.

The pistil is a peculiar columnar prolongation of the parenchyma in the centre of the flower. The pistil and stamens are called the organs of fructification.

The pistil has three subdivisions; ovary containing the ovules or rudimentary seeds; the style or columnar prolongation; and the stigma which caps the style. A stamens has also three subdivisions; the filament a thread-like stalk; the auther capping the filament; and the pollen a powdery substance contained in the auther.

POLLEN.

Under the microscope, pollen grains have the appearance of spores; very often covered with protuberances not unlike the burr of the common Datura. Dissection shows the pollen grain to have two membranes; the outer, called *extine*, has an inflexible integument; and the inner called *intine*, has a highly elastic integument. The intine is filled with fluid vegetable albumen; in which float inumerable particles of vibrionic matter called the fovillæ which have an incessant molecular motion, like swarming bees.

The stigma has a moist network of cells not covered by any epidermis, which receives the pollen. The cells of the stigma are tubes leading down through the style into the ovary. The moisture of the stigma swells the pollen grain, bursting the inflexible extine, and letting the intine escape. The latter then elongates down through the tubular cell of the style, and when it reaches the freer space of the ovary, swells out like a bladder, until it touches points where the ovules are attached to the embryonic sack. When the pollen cell touches this point, a minute cell makes its appearance on the ovule, into which the fovillæ pass, and it has become a living cell.

GENERATION.

Vegetal generation is effected by the meeting of two cells of different origin, the pollen cell containing the fovillæ, and the embryonic sack, each filled with potentially vital matter. They coalesce, mingle their contents, and a new cell springs up of actual vitality, out of which the individual plant is afterwards developed. Endowed with vital force, and constituted an individuality, the embryonic cell commences its development. From its free end, it elongates downwards; minute granular matter appears in its interior, which before was perfectly clear and transparent; soon transverse partitions appear, and the original cell is converted into a chain of cells, each having a distinct nucleus, the cytoblast. This first cell formation is by division of the original cell. After this chain of cells, as seen under the microscrope, has obtained some length, the lower cell becomes globular, swells, its contents becomes turbid, and by germination develops a globular mass of cells. In the interior of this globular mass, are first differentiated, the plumule and radicle, as well as the parenchyma and cellulose.

After fertilization has taken place, the embryonic sack enlarges, and by secretion, becomes filled with starch, gluten, oil and the albuminoids. It is then called the seed.

After the maturity of the seed, the vital force lays dormant until it is aroused by the intervention of heat and moisture, when it begins actual development into an organized, self-sustaining individuality of its parental type.

To enable it to develop, and to attain an organized structure, a supply of food was laid up for it by the mother plant, upon which it draws until the store is exhausted. Starch, or compounds of identical composition and proportions, are these stores generally, though there are some exceptions.

Plants of woody stems, such as trees and shrubs, come to rest after the exhaustion of the starch contained in the seed leaves, cotyledons; and make no further longitudinal growth that season. As far as I have observed, the peach is the only exception to this rule. It also comes to a rest and remains so, unless excited by cultivation and an abundant supply of air and nutriment. Under the latter favorable circumstances, it will resume its longitudinal extension, and continue it until the close of the season.

In annuals and perennials whose herbaceous stems die annually, (unless the cotyledon leaves are converted into aerial leaves) the exhaustion of starch, is also followed by a spell of languor or shorter inactivity, when growth recommences with increased vigor.

ABSORPTION.

Every plant draws the elements of its nutrition, either from the soil or from the air. Cells we have seen are closed on all sides, and the ends of the roots are covered with thin membranes, in which, microscopes of the highest powers have failed to detect any openings. How does the nutriment from the soil enter through this poreless membrane, and how is it transmitted and diffused through the cells after it enters? But first, what does it enter, and what is its condition when it does so? The substances entering are, lime, potash, silica, soda, magnesia water, ammonia, carbonic, nitric and sulphuric acid, etc. The condition of the alkalies is, they are dissolved in water, and so is ammonia. Water therefore is the medium by which they are introduced within the organism. The acids are in the gaseous state.—It is therefore evident that the plant cannot avail itself of any elements for nutrition, unless dissolved in water, or in a gaseous condition.

The transmission of matter dissolved in a liquid or in a gaseous state, through closed membranes is properly absorption. But on account of the movements started within the organism, after their entrance for their distribution, and re-distribution, it has been called by the scientific name of diosmose, which means, impulsion through, from two Greek words, *dia*, through, and *mosos*, impulsion. Diosmose means impulsion through lengthwise; but there also are two impulsions sidewise. To that sidewise inwardly, the name endosmose has been given; and to that from the inward outwardly, exosmose. All these terms are borrowed from chemical and physical science, and when employed to designate chemical or physical phenomena, are appropriate; but when used to designate physiological facts of life, in the absorption, distribution, and nutrition of plants, or animals, are of doubtful propriety. In physics, they mean only the reciprocal action, and reaction of dissimilar dead matter, in juxtaposition. But if the vital force is nothing more than chemical action and reaction, then life itself is but another name for mechanical action.

Of life itself we know nothing, and can learn nothing, except what we can discover in its manifestations. In the manifestations of the vital force, we can detect the presence of the cosmical forces, heat, light, electricity, magnetism, and chemical affinity as the modes of motion. It is well known that the cosmical forces are convertible, one into the other; and that through the whole cycle of changes, one is always the equivalent of the other. Motion, however, stands to them in the relation of genus; they being the species of motion. True, light, heat, electricity, magnetism, and chemical affinity, can all be converted into motion, and also we know that life is motion; but who has ever heard of converting heat, light, electricity, and so on, into life? Cosmical motion, and vital motion, then are not convertible terms. Though every one is conscious that life is motion, yet he recognizes it also as something more. While, therefore, it is allowable to use mechanical terms to illustrate and explain the facts and phenomena of life; yet we must be careful not to be led ourselves, nor lead others into materialism.

As already stated, in the manifestations of life, we detect the presence of the cosmical forces. For instance, there can be no life without a definite amount of heat. By the law of its being, each living organism is so constituted, that it can only exist within the limits of certain degrees of temperature. Within these limits, there is a point of the highest vigor of vital action. If the temperature varies, either by increasing or decreasing from this point, vital action suffers and will be destroyed, if the variation proceeds to extremes in either direction. Like gravity, heat is an exhaustible property of matter.— Always radiating from all points of space, it is yet incapable of exhausting its sources. The ulterior law controlling its radiation, is not known. But when anybody receives heat, either by radiation or conduction, it develops in it positive, and when it loses heat by radiation, negative thermo electricity.

In fact, heat seems to be the active agent for developing electricity, magnetism and chemical affinity. Chemical affinity only acts upon matter in juxtaposition, but electricity and magnetism, if a proper medium is furnished, can travel and act at indefinite distances.

But heat travels everywhere with or without medium. Life, like the other forces, requires heat for its development, but it would be an unpardonable blunder, therefore, to assert its identity with them. The cosmical forces operating on inorganic elements produce merely inorganic compounds; but when acting under the controlling influences of the vital force from inorganic elements they form organic compounds, and build up organic structure. It is therefore evident that within a living organism, they are the *servants* of the vital force. While from necessity we are unable to explain the phenomena of plant nutrition without the operation of the cosmical forces, we must always keep in mind that their action is subordinated to a controlling force, the vital force over them, and not a mere mechanical action as in inorganic matter.

How far, then, can these forces be made available to explain nutrition and the various phenomena of plant life? Heat, the omnipresent force inherent in matter, must in degree and intensity accumulate in and around the embryo to start it into life, and accompany it throughout all its future developments. When heat fails, growth ceases. Heat we have seen also develops and brings into action the other cosmical forces. One of these is electricity, a species of which is galvanism. What evidence have we that either electric or galvanic action is taking place in vegetation? The leaves give out oxygen in the ozonic condition the same as the electrodes of a galvanic battery. Whence comes this oxygen? The hydrocarbonates of which the elaborated sap is composed, shows that both water and carbonic acid have been decomposed to supply the hydrogen and carbon. There is no way of explanating these facts without admitting the presence of electric or galvanic action. Wherever there is electric action, there are two opposite poles to the current. One of these poles is evidently in the leaves, for no chemical decomposition takes place in a galvanic current, except at the poles of the battery. Where, then, is the other pole? Unquestionable at the other extreme of the organism, at the points of the roots. Is there any evidence of the galvanic action around and about the roots? We know that the alkalies are not free in the earth, but from many compounds; many of which are insoluble in water, but are easily resolved under the action of a battery. The plant manages, somehow, at all seasons to get a full supply of these, when we know there is not water enough in the soil to act as a solvent. Admit galvanic action and the whole mystery is explained.

Again, the medullary rays elaborate starch from the descending sap, and fix it in the cambrium and alburnum. Galvanic action again explains this. So also the formation of the alkaloid crystals as developed in the bast cells by the joint action of the bark and medullary rays. The motion of the protoplasm within the cell, being alternately, mutually repelled and attracted by the cytoblast, and the evolution of cellulose from the clear fluid of the cell, are all explainable upon the hypothesis of galvanic action. And so of many other phenomena in plant life.

It must also be borne in mind, that by the free interchange and transmission of the different elements of the cells, the alkalies and acidulous pieces of the plant are constantly commingling; which alone without any extraneous acid, would start a galvanic current.

The fact that the alkalies are not free in the soil, but bound up in various compounds has already been stated. But supposing they were free, they are so distributed through the soil, that it would be impossible to have rootlets enough to go out in search of them to collect them. Then, again, when collected, unless they were in juxtaposition with dissimilar elements with which they had affinity, they would be inert. But they are not inert. Here then is the difficulty. Since the roots are not numerous enough to search them out and to collect them, then they must go to the roots. If the mountain will not go to Mahomet, then Mahomet must go to the mountain. How can this chemical inertia be broken up, so that each particle will move to the roots? If there is any known law by which this can be effected, then the whole difficulty vanishes.

Suppose we take a vessel filled with a diluted acid holding some metal, gold for instance, in solution. We put in the vessel some metalic substance and operate upon it by a galvanic battery. The gold held in solution by the acid will move to, and be precipitated upon the metal, in other words, gilds it. Suppose again, instead of putting the metal to be gilded directly into the acid, we put it into a bladder or series of bladders, filled with water or any liquid dissimilar to the acid. We again subject it to a galvanic current, it is gilded the same as before. The galvanic current then has not only broken up the inertia of the gold held in suspension, but it has given it mechanical transportation not only through the acid, but through the animal integuments and the water. Hence we find that if we admit galvanic action in the roots, we solve at once two difficulties. It will not only give transportation of the alkalies to the roots but also through the membranes of the roots.

The question has been discussed, what gives the impulsion that makes the sap flow upward, as we find to be the case when in early spring a maple tree is wounded, and more especially in the bleeding of the grapevine? It is not necessary here to present the explanations given to account for this fact, but merely to state that none is satisfactory.

There are many phenomena manifested in plant life to which science has not yet furnished adequate explanations. If any two of these phenomena can be satisfactorily explained by one and the same agency, the presumption is in favor of the explanation afforded by said agency. There is one phenomenon, that of a plant possessing a higher temperature, when the thermometer ranges low, than the surrounding atmosphere, or soil even, which has not been explained. Can any supposed agency be imagined that will effect both the upward flow of the sap, and the excess of temperature?

Nitrogen is a chemical neutral, or rather negative. It enters directly into combination with no other element, but indirectly it forms the most powerful of all combinations. When other elements combine to form compounds, they, unless the compound occupies greater space than the constituent elements did, liberate heat. But when nitrogen enters into combinations it reverses this rule, it imprisons an enormous amount of heat as is attested in gunpowder. The universal characteristic of nitrogeneous compounds is their instability and easiness of dissolution by the least disturbing agent, often exploding with great violence—of which gunpowder, guncotton, nitro-glycerine and dynamite are examples. Nitrogen, in the form of ammonia, is absorbed by the roots. Within the tissue, starch is converted into the various forms of the albuminoid compounds, of which nitrogen is a component part. These again are transformed into the organic compounds cellulose and parenchyma, of which nitrogen is not a component part. In the breaking up of these nitrogeneous compounds, may not the nitrogen, by explosion, or at least by expansion when it returns to the gaseous form, give this upward impulsion, while at the same time it liberates the heat it fixed in combining?

For every season the plant has its appropriate work. In the spring, when it wakes up after its long winter nap, it repeats the identical operation its embryo did when it woke up in the seed: it nourishes itself by assimilating the starch into cellulose and parenchyma, sending its roots downward and its branches upward, and adorning them with leaves and flowers. It then neither grows laterally, unless the cells of the cambium ring be called lateral growth, nor does it elaborate and store up starch for the next year. Its work then is, by the ascending sap, to assimilate the stores of starch deposited the previous year into cellulose and parenchyma. But the ascending sap builds no structure excepting the pith, the medullary sheath that surrounds it, the medullary rays, the cuticle and leaves. In old plants it also fills up the old cells with cellulose, converting the alburnum into duramen, that is, heart wood. On the contrary, the descending sap commences its work when the stores of starch are exhausted. It builds the cambium layer and new bast tissue, and from it, as already stated, the medullary rays elaborate starch and other isomeric compounds, storing them up in the cambium and sap wood, the richest stores of which, however, are in the roots. Crystals of the alkaloids, possessing the medicinal properties of the plant, and sometimes highly poisonous, are elaborated likewise by the liber in the bast cells.

The movement and function of the descending sap is so evident as to leave no room for doubt. If a branch of a tree is girdled in spring, by removing the bark for an inch or so, that portion above the girdle will receive an abnormally large development of the cambium layer, store of starch and albuminoids, while below the girdle no cambium is deposited, and no starch elaborated and stored away. Moreover the downward flow of the sap will push the cambium downwards over the ring, and, if the latter is not too wide, will reestablish communication below it.

The building of cellular and vascular tissue by the ascending sap ceases about the summer solstice. The starch is then exhausted, and longitudinal growth comes to rest for the season. The plant is then organized, and it commences the work of enlargement laterally, and laying in provision for perpetuating its life. To this work, and to the ripening of its fruit and seed, it devotes the remainder of the season.

These are important facts in the economy of plants, which furnish many useful suggestions to the cultivator. When the starch is exhausted timber should be cut, for then it will afford but little food for borers. Starch, while it exists in the wood, is constantly being converted into albumen, which is a nitrogeneous compound, and unstable like all such compounds. Albumen in wood, like the albumen in fresh meat, is the cause of rapid decay and decomposition. Timber cut when the starch, and consequently also the albumen, is exhausted, will have greater durability than when cut in winter when full of starch. Again, starch is the provision stored up to develop new stems, roots and leaves the next season.

There is that foul, troublesome weed, the horse nettle (*Solanum carolinensis*), which sends its perennial root down too deep for eradication. Exhaust it by continual hoeing down, so that it will have no supply of starch to start growth with the next year. In July is the best time for sprouting, because then no reserve of starch has been deposited to develop organism in the future. You may smother the grass in your pastures the same way, by letting your stock crop it too closely when it is about replenishing its roots for the work of next year. Above all you may ruin your timothy meadow, by mowing before the leaves and stems have performed their functions in replenishing the roots, so that no new shoots will start either the same or the following year. That insensate summer pruning of the grapevine, which goes slashing in the vineyard in July and August, and which has very aptly been styled "summer slaughtering," is in violation of the laws of vegetable economy, and consequently followed with such direful results. I have seen a fine vineyard of Norton's Virginia completely exterminated by it in a single season. A knowledge of the laws of vegetable economy would have been worth thousands to its proprietor. A knowledge of the laws of vegetable economy may also be made available to increase the health, vigor and productiveness of plants, as well as their destruction. As we said at the beginning, the highest results of vegetable productiveness is not attained in a state of nature, either in quanity, or in growth, but is brought about by the intelligent control of man. Man cannot control the laws of nature, and an attempt to do so, must end in failure, destruction. All he can do, is to bring his operations to harmonize with, and to aid these laws. Sometimes his object may be destructive, as in the case of sprouts and weeds; but it is oftener to assist nature, in attaining the highest results. In either case, to act intelligently, he must know what these laws are, and the mode of their operation.

As almost everybody is now planting grapevines, I will take the vine as an illustration.

The object of pruning it is to attain the highest degree of health and vigor, and at the same time the finest and largest quantity of fruit. How will the laws of vegetable economy aid him in its operations?

The vernal growth of all plants, we have seen, is effected by a mere assimilation of the starch stored up the previous year. With the consumption of this, it extends its roots and branches, clothing the latter with bloom and foliage. When this is accomplished, its operations are all directed to provide for the future. Starch, we have seen, is laid up in the alburnum and roots, but more in the latter than in the former. Suppose, now, that the vine demands one hundred square feet of leaf surface immersed in the air, to perform its vital functions healthfully. We give it no pruning; it expands a leaf surface to one hundred feet or more. The leaves are smaller and more crowded than if they had been intelligently distributed. Some of them are insufficiently aerated, and they sicken and die, in consequence of which the general constitutional vigor of the vine is effected. There are more bunches of fruit than can mature; they also suffer. When the fruit is matured, the berries are small and the fruit is inferior. The vine also grows more and feeble canes than it can maintain in full vigor next year. This is the result that nature accomplishes unaided by the guiding, the controlling hand of man. How can better results be attained both in heathfulness and fruitfulness? The intelligent vine dresser inspects the size and constitutional vigor of the vine. He estimates its capabilities for bearing fruit, and its wants for vigorous health, and prunes off whatever is redundant for either. The starch being in excess in the roots, what is cut off in pruning would not suffice for forming the new extension of leaf and branches on the excised canes. The pruned vine, finding itself curtailed in its dimensions, starts vigorously the buds on the remaining canes, putting out a branch and a bunch or more of bloom, at each bud. The vine dresser watches its operations, and, looking to the future, will not let the vine expend its energies in producing that which is superfluous, and which will have to be pruned off next year. For fruiting canes next year he wants a definite number, according to the vigor of the vine. If the vine starts more than he wants, he rubs off the surplus. On the fruiting canes of the present year, he only wants healthy and adequate foliage enough to develop and perfect the fruit, and none to make surplus wood. Therefore, when a leaf or two has been developed beyond the last fruit bunch, he pinches off the extending cane. Thereby, he husbands the resources of the vine. For instead of exhausting itself in longitudinal extension and leaf building, it expends its vigor in developing the fruit and remaining leaves, both of which become abnormally large. The leaf, perhaps, twice as large as it would have been, had longitudinal growth not been checked.

From the axils of the leaves laterals may start, which, after developing a leaf or two, are again pinched off. The result is large, healthy, and not a crowded mass of leaves exhausting and smothering each, other, are developed in the immediate vicinity of the fruit, bringing it to the highest degree of perfection, while the cane, on which it grows, and which is to be pruned off the next season, makes but little growth.

But how is it with the canes for fruiting next year? They are left to take their own course unchecked by pruning, and develop an abundant supply of healthy, vigorous wood for the next year.

For the want of time, this illustration of the application of the principles of vegetable economy must suffice. There is, however, a mooted question, about the best time to cut timothy for hay, which deserves a passing notice. There seem to be many notions about this, and each one has his own; but no one has ever tried to settle it upon a scientific basis. This is a question that can be settled by experiments conducted upon laws of vegetable economy. If timothy can only yield the highest results to man, at the expense of its own life, then it ought not to be exacted of it. If it yields the best results to man, when time is given to provide, not only for the perpetuation of its own life, but of its species, then it ought to be known, to govern the operations of man. But at present neither is known.

To determine this, let equal areas of land be cut at different periods; one when in bloom; another intermediate, between the bloom and the full maturity of the seed; and one when the seed is fully ripe. Let the quantity obtained from each be weighed, both in the green and dry state; and let equal weights of hay of each be analyzed to ascertain the relative amount of nutriment in each. This will settle the question as to immediate profit. But let also the effects of cutting at each period, be noted on the health and vigor of the roots. These experiments and observations will elicit facts that will fix, beyond controversy, the particular time for cutting hay.

The example of the culture of the wine employed to illustrate the application of the principles of vegetable economy has furnished the fact, that culture, by directing and controlling the nourishment, affects a deviation in the fruit, making it larger, finer, and more delicious than in the normal wild state. Culture for an indefinite number of generations, not only fixes this deviation, but begets still greater. Deviation correlates to the care bestowed to effect healthy and more vigorous growth, by directing the energies into proper channels, and supplying more abundant nutrition. All our cultivated fruits were in this manner, by a long series of years and careful selection, developed from unpromising, acrid, wild specimens. The wild pear, an extremely acerb fruit, is yet found in Europe and Asia. How long a term of cultivation it required to make it palatable, is not known. But if Columella is to be believed, in his day the Roman Emperors, at their feasts, boiled it in wine to make it palatable.

Change in the external normal condition and nourishment, has converted single rayed into double flowers, by converting the stamens and sometimes the dish flowers into petals. The Dahlia and double Zinnia are recent examples of this law of vegetable economy. The tendency in all deviations, is uniformly to increase by further propagation.

But deviations are not always improvements. The departure from the normal type may take an opposite direction, and may become a deterioration, and this deterioration may increase; the farther propagation is carried under the abnormal condition of cultivation. In Europe this is the case when nut trees are cultivated. Cultivation, sooner or later, induces not only deterioration, but degeneration, which increases with the continuance of cultivation; while the wild trees never degenerate.

DISEASES.

Diseases of vegetation originate from disturbances or irregularities in the normal vital functions of the organs. They may be like their causes local, or general; and may make their appearance in different ways, according to the nature of the disease or the plant it affects.

The primitive causes of all diseases are perhaps always found to be external. The changed circumstances, unfavorable to healthy growth, brought about by cultivation, is a fruitful source of plant disease. These and local causes may enfeeble the plant so that parasitic plants make their appearance on the vital tissue, as mildew and blight. Insects may select the succulent shoots and leaves for deposing their eggs which develop galls and knots. But the most general diseases are sequences of violent metereological changes, such as sudden, frequent and extreme changes of temperature, excessive moisture, or drouth, etc. Local causes of disease are less detrimental than those that are general. With the cessation of local causes, and the removal of the affected part, health returns. Sometimes these causes are within the control of man, but not always. The potato disease is caused by sudden and severe chilling and flooding while growing. The fungus that rots it is not the cause of the disease, but the consequences of it. It is the common *cidium lactis* that merely seizes upon the dead matter of cells that have died, and decomposes it. The sweet exudation on the surface of the leaves, known as honey dew, is supposed to be occasioned by the engorgement of the leaf cells during the unfavorable condition of the atmosphere for evaporation.

Many plants suffer if they have not sufficient light; others love the shade, and perish if exposed to the full glare of the sun. Some flourish even during long continued drouth, but soon perish in excessive moisture, and *vice versa.* One plant needs a high, another a low temperature. Some perish if the sap freezes, and others can withstand uninjured a temperature many degrees below zero. Though there is a great variation in the temperature that plants can bear, yet there is none that can endure the boiling point. One plant is indifferent to sudden and great variations of temperature, another perishes even in a little variation.

The cultivator of plants, it will be thus seen, must possess not only an intimate knowledge of the structure, function and economy of plants, but of their constitutional vigor, habits and power of endurance.

TIMBER GROWING.

A Lecture by O. B. Galusha, delivered at the Illinois Industrial University, January 22, 1868.

The influences of forest trees upon the atmosphere, in purifying it by absorbing noxious gasses, in equalizing its degrees of humidity, in softening the asperities of its temperature, in checking the force of its violent gales, so often destructive to growing crops and injurious to domestic animals, and thus securing a carpet of snow in winter to protect the roots of plants from the damaging effects of severe frost, are truths upon which nearly all men of science and observation are agreed; and certainly, they are facts of so great importance that they should command the immediate attention of all dwellers upon the great western prairies. It does not come within the province of an essay upon "timber growing" to explain the principles in meteorology, electricity, chemistry and vegetable physiology, which operate to produce these important results. These subjects have been ably treated in other papers; yet, we may and should consider the effects of these causes, inasmuch as they indicate to us the path of duty or economy in the direction of forest tree culture.

Foreign nations accuse the "Universal Yankee Nation" of being "slaves to the almighty dollar." That the American people are impatient of results, is a fact of every day's observation; and this, perhaps, justifies, in a measure at least, the opinion which the citizens of the old world entertain of us. The consideration of profit to ourselves, instead of benefit to posterity or ultimate good to the nation, has ever been too prominent among our incentives to action. But the time has come when we are called upon to prosecute enterprizes which look beyond the present generation for results. We must, for our own national salvation, look threatening disasters full in the face, and prepare to avert them. If we are to achieve and maintain our manifest destiny as the greatest and most prosperous people upon the globe, we must at once commence laying the foundations of this success. One of the important steps in this direction is the cultivation of trees for their climatic influences and for uses in the mechanic arts. The wide extent of our American prairies renders this work far more imperative upon us than it has formerly been upon the people of trans-atlantic countries; yet, the history of many countries of the old world admonishes us of the folly of our present course of wholesale destruction of forests and neglect of planting new ones for the use of future generations.

The fact that our *home* groves are fast diminishing without adequate efforts being put forth to make up for the loss, is apparent to all. But it is *not* generally realized to how great an extent the same is true of the pine regions of the North, from whence we now draw almost our entire supplies of timber and lumber for building purposes. Lumber is becoming dear each succeeding year, not as has been generally supposed from the high price of labor, so much as from the fact, that the timber at almost all points easy of access, is either thinned out or entirely used up, so that logs are now often drawn great distances to the rivers, and floated long journeys to reach those mills, which, a few years since, were supplied from adjoining forests. The *amount* of *timber* in portions of these vast pine regions, has been greatly *overestimated.* I have traveled over and looked over hundreds of thousands acres of these lands, extending from the southern point of Green Bay to Lake Superior, and am fully persuaded that two acres out of three, in this great territory, are either destitute of trees, or covered with such varieties as are almost worthless. The fires which sweep over these vast plains, and through the forests, destroy the young trees, except here and there an isolated tract, so that we here find little or no provision for a supply, when the present crop of trees is exhausted.

While we cannot prevent the destruction of our forests for the use and benefit of the present generation, we can and should take measures to create forests upon our farms, which will be ample to supply the wants of those who are to come after us. Comparatively little has, as yet been done in this direction, and this little has been confined, mainly, to the cultivation of those varieties which are of rapid growth, and which would, consequently bring the quickest returns. While these varieties are, perhaps, more profitable for artificial groves than most of the slower growing ones, yet it is highly important that a sufficient number of kinds should be grown to observe all the purposes of the mechanic arts, and these arts, call largely for the close, firm texture of the slower growing varieties. I am inclined to the opinion that the rate of growth in trees is generally underestimated, and am quite sure that comparatively few land holders realize that large profits would ultimately accrue from cultivating groves, even of the more moderate growing varieties. To illustrate the rate of spontaneous growth of such sorts I will cite an instance which has come under my own observation.

A few miles from my residence, are a few acres of ground which were cleared of timber, sixteen or seventeen years since. There was then left upon the ground a growth of underbrush only, consisting of several varieties of oak, hickory, ash and some other sorts. I have watched the growth of timber there from year to year, until the present time, and am, myself, surprised at the result.

This land was worth when cleared, perhaps twelve dollars per acre not more. There have been taken from it, during the last seven years, poles, equal in value, probably, to ten dollars per acre; and one hundred and fifty dollars per acre would hardly buy the trees now standing upon it. So that if we estimate the value of the land (at the time mentioned) at twelve dollars per acre, and compute the interest upon this for sixteen years, at six per cent compound interest, adding the amount of taxes accruing during the time, with interest upon this at same rates, we have one hundred dollars per acre, as the net profit of the timber crop, while, of course, the land itself has partaken of the generally enhanced value of surrounding real estate; and would now probably sell for fifty dollars per acre, were the timber removed.

A German friend for whose integrity I can safely vouch, tells me that when he was a lad, and in his native country, his father had a tract of eighty acres of poor land, upon which he had tried in vain, to raise remunerating crops. It was finally prepared in the best manner and planted with seeds of Norway Spruce, (which grow readily there in the open ground). These trees flourished, and after a few years cultivation, were left to themselves, being thinned out as they became crowded.

At ten to fifteen year's growth, immense numbers were sold (in thinning out) for hop poles (and grape stakes). This tract is now a well timbered forest from which fair sized saw-logs are cut, and every part of a house can be built with its timber.

These seeds were sown only thirty six years ago! What would such a lot be worth upon the prairies of Illinois? Who would estimate its value at less than one thousand dollars per acre? What farmer upon the prairies of Illinois would wish to leave a better legacy to his sons? What has been done upon the poor hills of Germany, (except starting the plants in open ground) may be repeated, and with equal or greater results here, where all the hardy varieties of evergreen as well as deciduous trees grow luxuriantly.

The rates of growth in the more common varieties of trees may be observed by any one, and the time required to bring them to a size suitable for building purposes, (and use in the various mechanic arts) easily calculated; thus the actual cost of raising timber may be very nearly ascertained.

Let us estimate the expense of raising a grove of ten acres, planted with white ash and black walnut—five acres with each. These varieties grow at about the same rate and are about equally valuable for lumber.

The seeds of the ash, like all seeds of this class which ripen in the autumn, should be gathered when ripe, and kept in the cellar through winter. The walnuts (as other nuts) should be spread evenly upon the ground, where surface water will not stand not more than two nuts in depth, and covered with two or three inches of mellow soil, that they may freeze during winter—to be planted as soon in spring as they show signs of sprouting. The land should be deeply plowed—late in fall if practicable and finely pulverized in early spring, and marked both ways, as for corn, 3 feet 8 inches apart. The tree seeds and nuts should be planted eleven feet apart, which will admit of two rows of corn or potatoes between each two rows of trees. By putting two or three seeds in a place—to be thinned out to one if both or all germinate—an even stand may be secured. A better way is to plant in rows eleven feet apart, running north and south, and three feet eight inches (in the marks for corn.) This will secure straight trees—being closer—and they may be thinned out to eleven feet each way when large enough to use for grape stakes, bean or hop poles. This will give three hundred and sixty trees per acre, or three thousand trees in all, allowing for sixty vacancies. Though in all cases of tree planting, whether in groves or screens, a supply of good plants, grown elsewhere, should always be in readiness to use in filling vacancies which should be done at the end of the first year.

The preparation of the ten acres of ground at five dollars per acre would be fifty dollars. Average cost of seed fifty cents per acre —five dollars. Planting, twenty-five dollars. The cultivation during the first five years will be paid for in the crops grown between rows. For cultivation from fifth to ninth years,—four years—with horses only—thirty dollars per year, one hundred and twenty dollars. After this time no cultivation or care will be needed. This makes the entire cost, in seed and labor, of the ten acres of trees two hundred dollars. These trees will, at twenty-five years of age average sixteen inches in diameter at the ground and about ten inches at the height of sixteen feet. This will give, deducting waste in sawing, one hundred and twenty feet of lumber per tree, Allowing one-sixth for damage by the elements and loss from other causes, we have in round numbers three hundred and sixty thousand feet of lumber; which, at fifty dollars per thousand, would amount to eighteen thousand dollars. The value of the tree tops for fuel would be equal to the cost of preparing the logs for the mill, and the expense in sawing would not exceed five dollars per thousand feet. This added to the cost of producing the trees, and the amount deducted from the value of the lumber, leaves *sixteen thousand dollars for the use of ten acres of land for twenty-five years*, and the interest upon the amount expended in planting and cultivating the trees!!! This statement may be deemed incredible, perhaps by those who have not previously turned their attention to the subject; but after much study and many years observations and measurements of growths of different varieties of trees. I am convinced that in all well-conducted experiments in growing artificial groves upon our large prairies the profits will not fall *far* (if at all) short of the rates above stated. It must be borne in mind that trees standing at regular and proper distances, upon rich prairie soil, and receiving good cultivation will grow much faster than the same varieties usually found growing in natural groves. For a list of varieties suitable for planting in artificial groves, I would refer all interested to the lists recommended by our State Horticultural Society; with there mark that the planter can hardly be in error in planting any tree which is indigenous in a soil and climate similar to his own; while many trees whose native homes are found in latitude, north or south, have thus far proved valuable, as the Osage Orange and Catalpa from the South, and the Red Pine and White Spruce and others from the North.

Also, some foreign varieties are equal or superior to any of our natives, among which are European or Scotch Larch, (best of all foreign deciduous trees), Austrian and Scotch pines, Norway spruce and white willow.

I regard this last as probably combining more desirable qualities for cultivation in groves for lumber purposes than any other variety of the soft wood, rapid growing deciduous trees, and am decidedly of the opinion that this and the golden variety are the best deciduous trees within my knowledge for wind breaks or screens, but wish to be distinctly understood as not recommending this tree as a "hedge plant," or the planting of this or any other one sort to the neglect of other desirable varieties. Strong cuttings of this tree seldom fail to strike root at once in mellow soil, and will make a growth of from two to six feet the first season. It thrives in all kinds of soil, making as much wood in a given number of years as any other known sort, not even excepting the cotton wood, growing into a large tree, sometimes four feet in diameter. The wood is of rather fine texture for a light wood, making a fair article of soft lumber, which bears a fine polish. It is also valuable for making wooden ware, (bowls, trays, etc). It also splits freely, which is a desirable quality in making fence posts, rails, railroad ties, and fire wood. I would here remark that it is more than probable that before five years are past the present mode of infusing the gasses of coal tar into the pores of timber will be so improved, or some other method will be invented by which the soft and porous woods will be rendered almost indestructible, and at a trifling expense. If any Professor or student in this University would accomplish this achievement he would confer a blessing upon the State which would repay an hundred fold all the expense of establishing and maintaining it. The golden willow is similar in growth and texture to the white, but I think does not make so large a tree. I have measured about a dozen trees of this variety (golden) which were planted by the roadside fifteen years ago last spring, and find the average circumference of the trunks at three and a half feet from the ground to be five feet and three inches. A white willow, standing near my house, which has grown from a small cutting put in thirteen years ago last spring, now measures six feet and two inches in circumference near the ground, forming a head or top thirty feet across. This variety, when planted in groves, grows tall and almost perfectly straight.

I have carefully computed the expenses of raising ten acres of trees of this variety, and converting them into lumber and find the entire cost not to exceed ten dollars per thousand feet.

This estimate is based upon actual measurement of the growth of trees. The land is valued at forty dollars per acre, with interest upon this amount, together with expenses computed, as before, at six per cent. compound interest.

I take ten acres in these estimates of growing artificial groves because it is desirable to have trees enough together, or in close proximity, so that the cost of putting up and removing a saw mill would be but a trifle upon each thousand feet of lumber sawed.

TIMBER BELTS.

The actual profits which would accrue from a general and uniform system of cultivating trees in belts, or double rows, for protection, cannot as readily be estimated; yet no one who has carefully investigated this subject can doubt the utility and economy of such screens.

To show the possible extent of their beneficial influence, I will call up an instance which, probably, very many of this audience will remember. In the year 1862, at the time when spring wheat and oats in the northern portion of the State were just past the bloom, and a portion of the grains in the "milky state," we were visited by a storm from the northwest which swept over this portion of the State, prostrating nearly all the grain not sheltered by timber.

I have selected this instance as an illustration, because of the extent of the storm, and also on account of the marked effects of protection by timber in this storm, which clearly showed that the entire loss might have been prevented by belts of trees. "In one location a single line of broad and tall willows (closely planted) proved a sufficient check to the wind, so that a field of wheat adjoining it upon the east stood erect, and was harvested with a machine, while in exposed situations, the shrunken grain, if saved at all, was often gathered by the slow and tedious process of hooking it up with scythes. (This fact was published in transactions of Ill. State Hort. Soc.) Many thousands of acres were left to dry, and were burned upon the ground, which two or three weeks before harvest promised abundant crops. The extra expense of gathering the grain of that harvest could not have been less than fifty cents per acre of the whole amount harvested.

I traveled quite extensively over this portion of the State before and soon after the harvest of that year, and am convinced that one-half the value of the wheat and oats in the territory passed over by that storm was destroyed by it.

There were sown in that year (as per census reports), in the thirty counties lying north of the Burlington, Peoria and Logansport Railroad, about one million two hundred thousand acres of wheat, and at least one-fourth as many of oats. Allowing one-tenth of these crops to have been protected by timber, we find the loss to have been equal to five hundred and forty thousand acres of wheat, and one hundred and thirty thousand acres of oats.

Computing the wheat at fifteen bushels per acre, and the value at fifty cents per bushel; the oats at thirty bushels per acre, and price twenty cents per bushel, we have the sum of four millions eight hundred and sixty thousand dollars, as the cash value of property in these two crops alone, which was destroyed in a single storm in an area of a little more than one-third of our State.

Allowing one hundred and fifty thousand acres to have been burned (or not harvested), and adding to the amount of loss fifty cents per acre of the remainder of the nine-tenths (lodged grain), equal to six hundred thousand dollars, to previously estimated losses, it swells them to the enormous sum of five millions four hundred and sixty thousand dollars.

Let us see how much it would cost to plant and cultivate screens to prevent such losses. A double row of White or Golden Willows with trees in the second row set opposite the spaces in the first, planted upon the west side of every eighty acre lot, would doubtless prove sufficient, as they would, at the age of twelve years, form a dense wall of foliage about forty feet high, and would, of course, increase in size for many years thereafter.

These would cost, per mile of screen, about as follows: Average value of two acres of land, forty dollars per acre, eighty dollars; preparation of the soil, and planting with strong cuttings, ten dollars; cultivating the first two years, twenty dollars, making a total cost (with purchase money of the land) one hundred and ten dollars. After two years no care will be needed, save a mulch of refuse straw, to be renewed once in two or three years, the cost of which will be more than repaid in the partial protection which the trees will render previous to the twelfth year.

There are in the thirty counties referred to about sixteen thousand six hundred and twenty-five sections of prairie land. This will require sixty-six thousand and five hundred miles of screen, if planted as above proposed, making the entire cost seven millions three hundred and fifteen thousand dollars. Thus we see that, without estimating the immense damage done to fruit and other crops, the wheat and oats destroyed in that storm would, if saved, have paid about three-fourths the entire expense of growing timber-belts throughout that entire territory!!

I think it may be safely estimated that an average of one-twelfth part of all our crops of grain and large fruits are destroyed by violent winds; which such a system of protection, or its equivalent in groves, would so far check as to prevent the destruction. If this is true, such protection would save to the husbandmen and orchardists its entire cost every two, or, at most, three years. Such protection, too, would, by causing the snow to remain spread evenly over the surface of the ground (as before hinted), enable the farmer to raise winter wheat in localities where it is now impossible to do so.

If we add to the benefits of tree culture already considered, those far-reaching and incalculably valuable climatic influences which would flow therefrom, we must all admit the necessity of commencing this great enterprise at once, and prosecuting it with vigor.

I do not introduce this plan of planting straight belts of trees a quarter of a mile apart because it is the most desirable plan which can be adopted, for no man of taste would regard it as such. The eye would soon tire of such stiffness and monotony in the landscape. Tree planting may be so planned and conducted as to give beauty to the landscape, and at the same time secure nearly all the combined benefits of protection to crops, timber for uses in the mechanic arts, and those climatic influences which we all regard as so important. Of course no rules can be given for such tree planting. Generally where the surface is somewhat undulating (for we have no hills), the planting should be done mainly upon the higher portions of the farms, and along the water courses. Where the surface is level, belts may be planted upon the north and west of the farms, with groves upon the least valuable portions. These last would intercept the straight lines, and give diversity. But if each prairie farmer were to follow his own taste, or adapt his planting to secure the greatest profit in timber or protection to his own farm, planting about one-tenth of his land with trees, it is probable that all the desirable ends which we have been considering will be gained, and the landscape sufficiently diversified to be pleasing to the eye.

Here, then, brother farmers, and future farmer students in this University, we have two pictures presented to us. In the one we look into the future and see wide spread desolation: An extended treeless country, visited by destructive storms, by severe drouths, with its streams dried up, and food for man and beast in such scarcity that the poor can scarcely obtain a supply. On the other we see a charming landscape, a rich, fertile country, a population enjoying all the blessings which flow from peace and plenty.

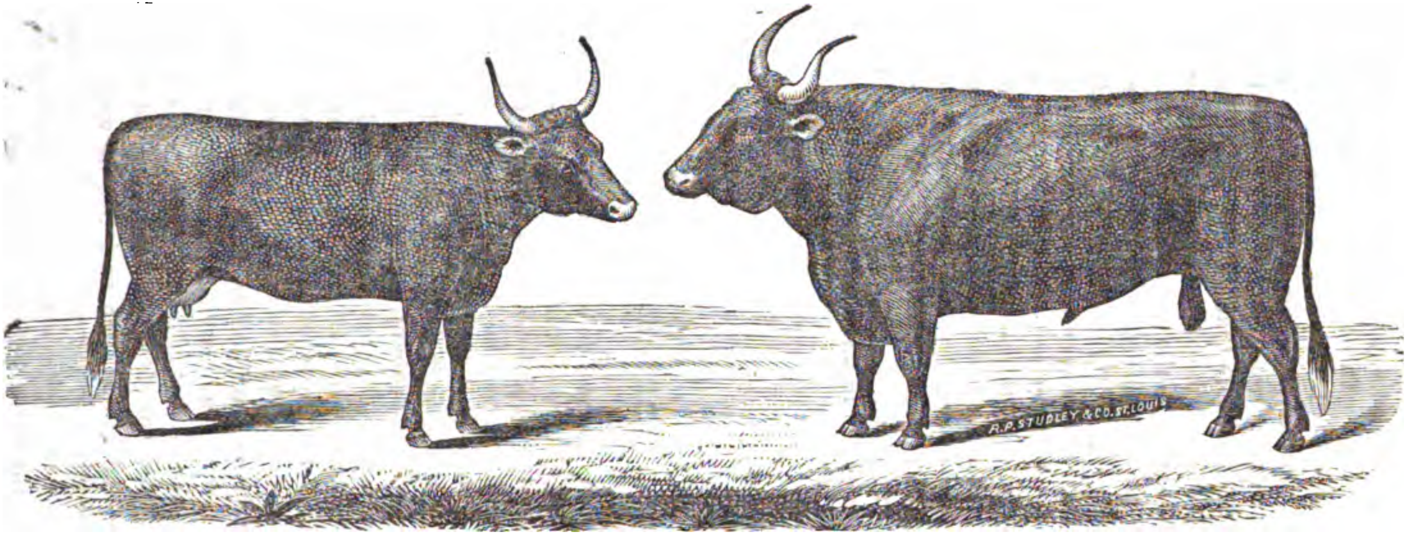
Which will you choose? Will we take warning in time, and arouse ourselves to action in an enterprise which promises such rich results?

DEVON CATTLE.

Concluding from the awards of premiums offered by the officers of the Agricultural and Mechanical Association of St Louis, for Devon cattle, compared with those offered for Short Horns, that they, and perhaps many of the people of the State of Missouri are unacquainted with the breed. I send some engraving of Devon cattle, also a short history of them, including their most prominent characteristics, together with a scale of points by which to judge of their excellence. [The scale of points was published in our report for 1865, and is therefore omitted—SEC.] Devons, as they existed 200 years ago, like the buffalo and deer of to-day, were considered as a race and not a breed, according to the definition of Goodale.

Races are varieties moulded to their peculiar type by natural causes with no interference of man, and no admixture of other varieties; having continued substantially the same for a period beyond which the memory and knowledge of man does not reach.

By breeds are understood such varieties as were originally produced by a cross or mixture, and subsequently established by selecting for breeding only the best specimens, and rejecting all others, and so continuing until the desired object is attained.


R. P. STUDLEY & CO. ST. LOUIS

DEVON CATTLE—"POTOMAC AND SUCCESS."

Devon Bull "Potomac," (528), calved March 15, 1857, bred by C. S. Wainright, Rhinebeck, New York, the property of C. D. Bent, Grand View, Louisa county, Iowa. Sire imported Omar Pasha, (513), dam imported Moss Rose, (904).

Devon Heifer "Success," calved July 31, 1866, bred and owned by C. D. Bent, Grand View, Iowa. Sire Worth, (377), grand sire imported May Boy, (71), dam Belle of the West, (1179), by imported Meguntícook, (251), grand dam Belle of Winchester, (1180), by imported Albert, (2).

The Devon cattle have been known to exist for many centuries, and not until within the last 200 years have any scientific efforts been made to improve them. The Devonshire farmers owing to the nature of their soil and climate, possessed a superior race of cattle in spite of non-exertion, but within the last one hundred and fifty years they have been greatly improved.

Among those most successful in the improvement of the Devons, Mr. Francis Quartly stands at the head of the list. He endeavored by a long course of selection, and an intimate knowledge of the principles of breeding, to combine the various elements in the different herds, so as to attain the great object of the Devon breeds, the lessening of the parts of the animal frame least useful to man, as the bone and offal, and at the same time the increase of such other parts, as fat and flesh, that furnishes food, and to do this at the earliest possible age, and with the least consumption of food.

That Mr. Quartly fully succeeded in establishing these characteristics of the breed, we need no better evidence than that nine-tenths of the prize animals recorded in Davies' Devon Herd Book, descended from his herd. Among which might be mentioned some of the most prominent: Forrester, (46), Hundred Guinea, (56), and the cow Curley, (92).

As regards their milking qualities, I believe that Mr. Bloomfield the manager of the late Earl of Leicester's estate, has done more in the way of improvement than any other, having so increased their milking qualities as to have obtained a prize for having produced an average annual yield of 200 pounds of butter per cow, in a dairy of twenty cows.

The milking qualities of the Devon cow are generally good, although by some have been overlooked in their anxiety to obtain a beef animal. Beauty, (533), bred by Mr. Hurlbut, produced 16 pounds of butter per week. Helena, (774), imported by Mr. Wainwright, gave as high as 22 quarts of milk per day, and made 15 pounds of butter per week. Old May Flower, the grad dam of imported May Boy, (71), made over 17 pounds of butter per week. Flora 2d, (120), by Eclipse, (19), imported from the breed of Mr. Bloomfield, once owned by me, but now dead, made 21 pounds of butter in 9 days. Mr. Coleman says in his European Agriculture, "The most prodctive cow in butter which I have found, was a North Devon, which for several weeks in succession without extra feed, produced 21 pounds of butter per week.

The Devon ox is not equalled by any other for work, consequently something of the heavy inert squarely moulded frame, of the merely beefing animal must be relinquished for a lighter and more active one, with a more sloping shoulder favorable to action, which is more than compensated for in many sections, and under circumstances where the advantages of food are unfavorable. While as a breed, their unparalleled capabilities of mastication and digestion, with a thick curly coat of hair, combined with a thick mellow skin, adapt them to our Western stalkfield ranges, as well as to the coarse natural hay of our river bottoms, where in many cases it is desirable to winter large herds of cattle on that kind of feed alone.

Last, but not least, is the manner in which they increase in flesh or fatten. This perhaps is the most remarkable feature of the Devons. They do not pile up their fat in patches on different parts like many other breeds, but undergo a kind of thickening up process, their meat, becoming very thick and beautifully marbled with alternate particles of fat and lean.

This quality, with the evenness and amount upon the most valuable parts, were perhaps among the main reasons for preferring the Devons to the Short Horns in the class of fat cattle at the Royal Agricultural Societies show, in England the past season, according to late reports.

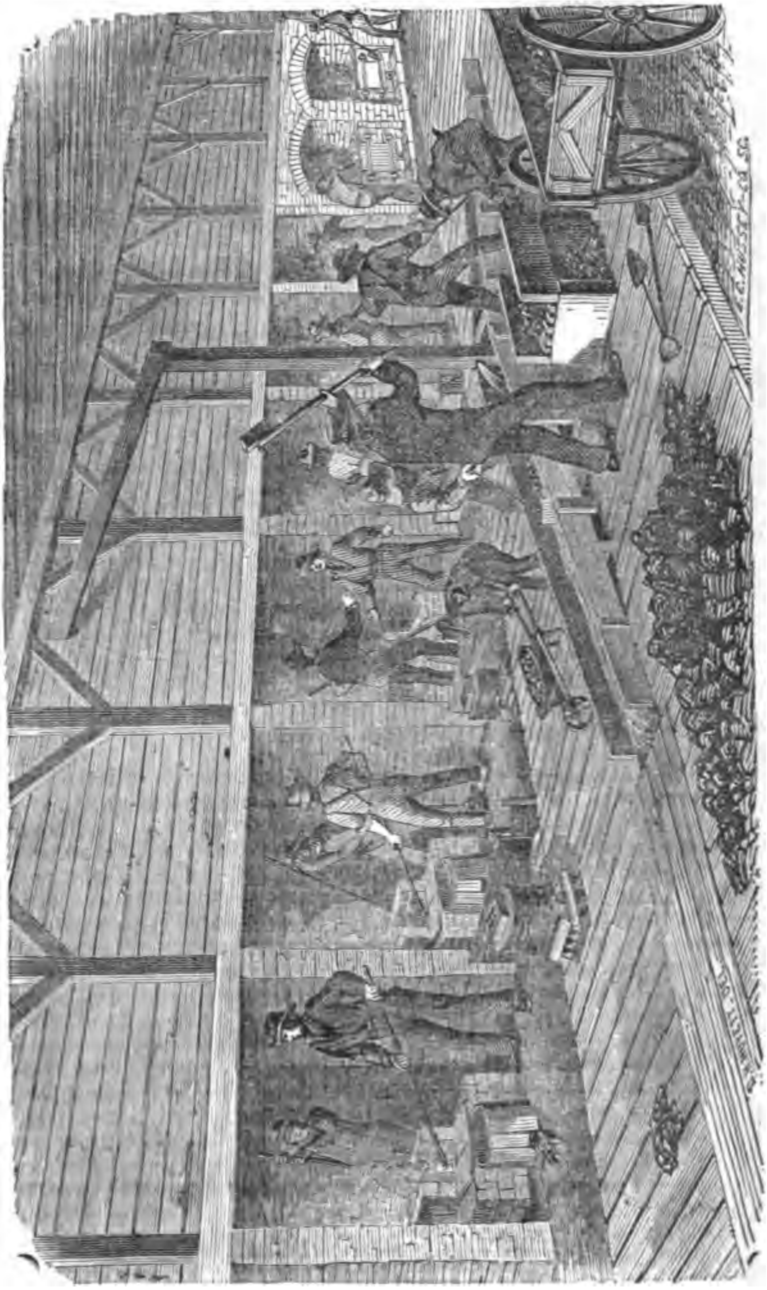
The late experience of those well acquainted with the merits of Devon cattle, only confirms their former opinion of them, that for the three grand objects for which all meat stock are kept, viz: milk, work, and beef, they are equal if not superior to any other breed, and the only objection ever made to the breed, is size. But we can keep more of them, and on shorter pasture and shorter food; and when full fed, will make a gain equal to any other breed. As an instance, this fall I shut up an eight month's old calf to wean, he made a gain of one hundred pounds in thirty days, the feed being corn ears.

In short, as many pounds of beef and of a superior quality can be produced with the Devon on a given amount of food, as any other breed, only requiring more animals to accomplish it. While their adaptation to the extremes of climate or mountainous and sterile regions, will always create a demand for them. C. D. BENT.

GRANDVIEW, LOUISA COUNTY, IOWA, February 4, 1869.

THE SIMMONS IRON MOUNTAINS.

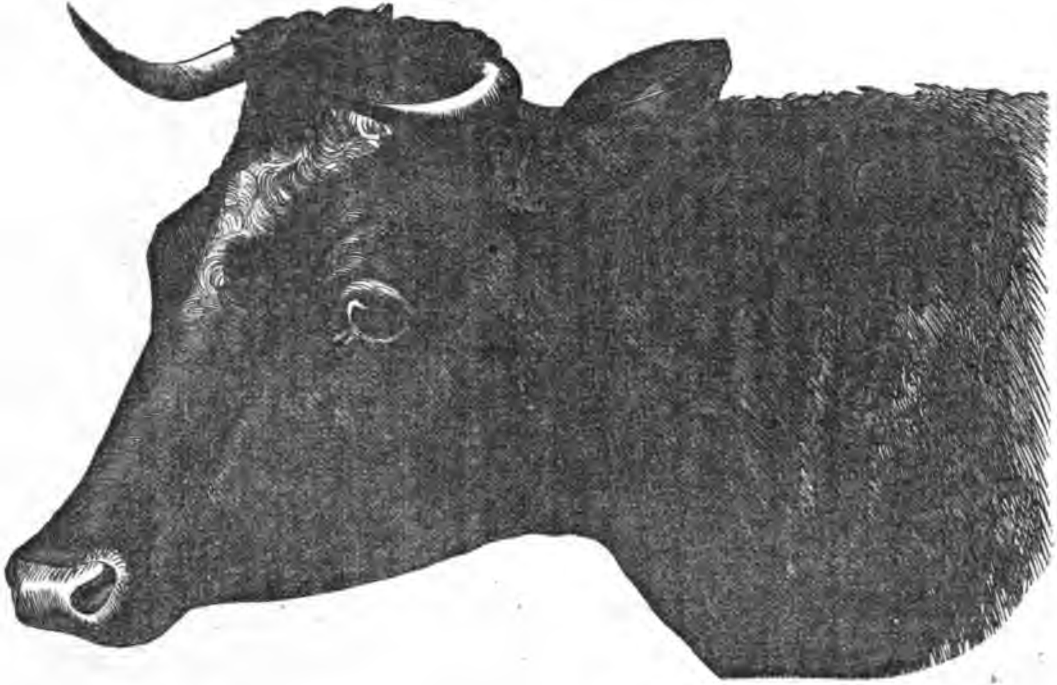
This mountain is near Salem, in Dent county, Missouri. Practical engineers who have explored it conclude that it is one solid mass of iron, and that if it were worked at the rate of 100 tons per day, it would take over *eleven hundred years*, working every day in the year, to exhaust it.



INTERIOR VIEW OF LEAD FURNACE AT GRANBY, NEWTON COUNTY, MISSOURI.

E.C. HUSSEY-C° SC. ST LOUIS

A MISSOURI FARM HOUSE.



HEAD OF "AURORA II," SHORTHORN.—OWNED BY H. G. WHITE, SOUTH FRAMINGHAM, MASS.

THE TEXAS CATTLE FEVER.

In our report for 1866, the subject of Texas Cattle Disease was laid before the General Assembly and the people of the State, in such a collection of facts and statements as had been procured from various portions of the State during the year. This, and the legislation following, which was intended to prevent the introduction of the disease, created much censure and opposition, not only in our own but also in other States.

During the past year, however, the trade in Texas cattle having been very much increased and extended, the disease spread from Kansas to the New England States, and immense losses were suffered from it at various points where the Texas cattle were handled. The evidence became so overwhelming that the disbelievers in the existence of any such disease were forced to yield somewhat before it.

The Commissioner of Agriculture. Hon. Horace Capron, with a proper regard for the important agricultural interest involved, appointed Professor Gamgee to make investigation in regard to the character of the disease; the Illinois State Agricultural Society sent out a commission; the Pork-packer's association of Chicago, sent out another, to make investigations; and a commission from the Province of Ontario (Canada) also visited the States for the same purpose. The cattle commissioners of the State of New York were set actively at work. Thorough measures were instituted by the health commissioners of New York City, and the boards of health of other cities interested were not inactive.

The intense interest awakened in this subject throughout the country, may be said to have culminated in the convention of cattle commissioners at Springfield, Illinois. In order to give place to the proceedings of that convention, which will be found interesting and highly important, the mass of facts collected from other sources during the season, will be withheld.

The convention in question originated as follows:

On the 30th of September, during the time of the New York State Fair, a meeting was held at Rochester, New York, for the purpose of considering the propriety of holding a convention with reference to the cattle plague. There were present, the commissioners of the State of New York, and several gentlemen connected with the New

York State Agricultural Society, and also, by invitation, the following gentlemen fram Canada, viz: Hon. C. Christie, President Board of Agriculture, Ontario; Thomas Stock, Esq., President Agricultural Association, Ontario; Hon. A. A. Burnham, member of the Board of Agriculture, Ontario.

There was entire unanimity of opinion as to the necessity for a convention, and it was resolved to recommend to the governments of the several States and Provinces interested, that three commissioners from each of the States and Provinces in question be appointed by them to attend a convention to be held at Springfield, Illinois, on the first of September, 1868.

In the latter part of October, Governor Fletcher received the following circular, transmitted with favorable commendation by the Governor of New York, and immediately forwarded the same to the Missouri State Board of Agriculture, with the request that the board suggest the names of three suitable commissioners:

ALBANY, October 13, 1868.

DEAR SIR:—In view of the ravages of the disease known as the Texas Fever among cattle, and the inadequacy of the laws enacted by the several States for the repression of this and other kindred diseases, and the conflicting provisions of these laws, which have been disclosed since this disease has been prevalent, a general desire has been expressed by farmers, drovers and the consumers of meat in several States, that a wise and efficient system of legislation should be adopted for the repression and prevention of this and other similar diseases in the several States, so that the laws should be harmonious and adapted to mutual protection. And it has been believed by nearly every one that has expressed an opinion upon the subject, that the best mode of effecting this object is by the assembling of a convention of the cattle commissioners of the several States interested in the subject, who would represent all the varied interests of the producing and consuming States, and supply all the information necessary for the full elucidation of the subject, and whose duty it should be to prepare a draft of a law which should ensure the most perfect protection to all parties, to be recommended to the several Legislatures for adoption. And the commissioners of the State of New York having been requested by the commissioners of several of the States, and of the Dominion of Canada, to take the initiative in calling such convention.

We do, therefore, recommend that a convention be held in the city of Springfield, in the State of Illinois, on Tuesday, the first day of December, 1868, at 12 o'clock at noon of said day.

The object of such convention is to consider the pathology, symptomatology and history of the Texas cattle fever and other infectious and contagious diseases to which cattle and other stock are subject, and the best methods of preventing the spread of such diseases with reference to the interests of the producer and consumer, and also to consider the sanitary requirements of the community with reference to the feeding and rest of the animals in transitu, and to the best methods of slaughtering and preparing them for market. The convention will also prepare a draft of a law which shall provide for the accomplishment of these objects, to be submitted to the Legislatures of the States represented therein for adoption. Each State and Province to be represented by three commissioners.

The cattle commissioners of the State of Illinois are requested to secure a suitable place of meeting for the convention.

His Excellency, the Governor, is hereby respectfully requested to transmit copies of this call to the Governors of the several States, where such commissioners are not already appointed, with a request that they would appoint such commissioners to represent their States in such convention.

M. R. PATRICK,
L. F. ALLEN,
JOHN STANTON GOULD.

PROCEEDINGS AND DEBATES

OF THE

AMERICAN CONVENTION OF CATTLE COMMISSIONERS,

HELD AT

SPRINGFIELD, ILLINOIS, DECEMBER, 1ST, 2D AND 3D, 1868.

SPRINGFIELD, ILLINOIS,
Wednesday, Dec. 1, 1868.

The American Convention of Cattle Commissioners assembled in convention at Representatives' Hall, Springfield, Illinois, at 12 o'clock M., in pursuance of the invitation of Governor Oglesby.

DR. JOHNS, of Illinois—Gentlemen, will you please come to order. I nominate Joseph Poole, Esq., of Indiana, temporary chairman of this convention.

The motion prevailed.

THE CHAIRMAN—Gentlemen and commissioners of the convention, the honor conferred upon me by this unexpected appointment is accepted with diffidence, and a perfect knowledge of my inability to fill so important and responsible a position. Permit me, gentlemen of the convention, to thank you for the honor thus conferred, and to ask your indulgence and forbearance towards me in the discharge of my duties.

DR. JOHNS, of Illinois—Mr. Chairman, I move that Mr. H. D. Emery, of Chicago, be the temporary secretary.

The motion prevailed.

DR. MORSE, of Missouri—I move, Mr. Chairman, that a committee on credentials, consisting of three members, be appointed by the chair.

THE CHAIRMAN—I should prefer that the appointing power be left with the convention. Will the gentleman accept of that suggestion as an amendment to his motion?

DR. MORSE—Certainly, sir.

The motion prevailed, and the following gentlemen were appointed by the convention to serve on this committee: Dr. Morse, of Missouri; Mr. Howard, of Michigan; Dr. Johns, of Illinois.

MR. CHRISTIE, of Canada—I move, Mr. Chairman, that a committee of ten be appointed by the convention as a committee on permanent organization.

The motion prevailed, and the following gentlemen were, on nomination, designated to serve: Mr. Christie, of Canada, chairman; Prof. Smith, of Missouri; Mr. Messenger, of Ohio; Mr. Allen, of New York; Mr. Carter, of Maryland; Mr. Earl, of Indiana; Dr. Miles, of Michigan; Dr. Snow, of Rhode Island; Dr. Thayer, of Massachusetts; Mr. Reynolds, of Illinois.

DR. JOHNS, of Illinois—I move, Mr. Chairman, that this convention do now adjourn, to meet again at half-past two this afternoon, by which time the committees on credentials and permanent organization will probably be ready to report.

The motion prevailed.

AFTERNOON SESSION.

THE CHAIRMAN—The convention will please come to order. Gentlemen, the first thing to be presented to us is the report of the committee on credentials. Is the committee ready to report?

DR. MORSE, of Missouri, chairman of the committee on credentials—Mr. Chairman, I beg leave to submit the following report:

We, the undersigned, committee on credentials, respectfully report that we find the Province of Ontario duly represented by the following named commissioners: Hon. D. Christie, A. A. Burnham, F. W. Stone.

The States, so far as represented, by the following:

Illinois—John P. Reynolds, Dr. Wm. Kile, H. N. Edwards, E. A. Piper, Dr. H. C. Johns.

Indiana—Joseph Poole, James Matthews, A. Earle.

Maryland—Dr. Nathaniel Brown, Dr. Richard Mackall, Dr. W. S. McPherson, John M. Carter.

Massachusetts—Dr. Elisha F. Thayer.

Michigan—Dr. M. Mills, Sanford Howard.

Missouri—Dr. L. D. Morse, Prof. Spencer Smith, H. J. Moore.

New York—Marsena S. Patrick, Lewis F. Allen, John Stanton Gould.

Ohio—James Stockdale, Dr. Wm. Clendennin, D. McMillan, Thomas Reber, E. Messenger.

Rhode Island—Dr. E. M. Snow.

Wisconsin—Prof. P. A. Chadbourne, B. R. Hinckley.

We also recommend the following named gentlemen to seats in the convention as honorary members:

Arthur B. Barrett, Jefferson K. Clark, G. O. Kalb, delegates of the St. Louis Agricultural and Mechanical Association. Also, Dr. M. Morris, of New York; Dr. John H. Rauch, of Chicago; H. D. Emery, of Chicago; Joseph A. McCoy, of Abilene, Kansas.

The report was received and adopted.

THE CHAIRMAN—Gentlemen, the next thing in order is the report of the committee on permanent organization. Is that committee ready to report?

MR. CHRISTIE, of Canada, chairman of committee on permanent organization—Mr. Chairman, the committee beg leave to submit the following report:

That Hon. Lewis F. Allen, of Buffalo, be the president of the convention.

That Hon. D. Christie, Thomas Reber, Dr. Richard Mackall, General M. S. Patrick, P. A. Chadbourne, E. F. Thayer, Sanford Howard, Capt. H. J. Moore, Dr. H. C. Johns, Joseph Poole, Dr. N. S. Townsend, A. B. Hamilton, and Dr. Snow, be vice-presidents of the convention.

That J. P. Reynolds, of Illinois; Dr. L. D. Morse, of Missouri; and Dr. Moreau Morris, of New York, be the secretaries of the convention.

That Messrs. Ely, Burnham and Bartlett be the official stenographic reporters to the convention.

All of which is respectfully submitted.

DANIEL CHRISTIE, *Chairman.*

The report was received and unanimously adopted.

MR. REYNOLDS, of Illinois—Mr. Chairman, I move that a committee of three be appointed by the chair to escort the president of the convention to his seat.

The motion prevailed.

THE CHAIRMAN—I appoint Mr. McMillan, of Ohio, Mr. Johns, of Illinois, and Mr. Earl, of Indiana, to perform that duty.

The gentlemen named conducted Mr. Allen to the chair.

THE CHAIRMAN—Gentlemen, permit me to introduce to you the president of this convention, Hon. L. F. Allen.

THE PRESIDENT—Gentlemen of the convention, I feel highly gratified and as highly honored at being selected by so respectable and dignified a body of gentlemen as I see before me, to be their presiding officer on this occasion. You will kindly excuse my inexperience, the want of tact I may exhibit, and the many lapses of duty that may occur during such time as I may fill the chair. I only say that I will serve you according to my best abilities.

As many conflicting interests may, perhaps, arise, and considerable discussion may ensue, I beg leave to suggest that our time is precious, and that remarks should be made as short and comprehensive as possible. I will, myself, set the example, by saying no more, but simply ask you to proceed to the consideration of the subject which has brought us together.

DR. MILES, of Michigan—Mr. President, as it seems desirable that there should be some name for this convention, I therefore move that it be called the American Convention of Cattle Commissioners.

The motion prevailed.

MR. POOLE, of Indiana—Mr. President, I move that the gentleman from New York, Mr. Gould, address the convention, as he has devoted a great deal of consideration to the subject in which we are all so much interested.

The motion prevailed.

Dr. JOHNS, of Illinois—Mr. President: I move that his excellency, the Governor of Illinois, be invited to a seat beside the president. The motion prevailed, and his excellency accepted a seat by the side of the president.

Mr. GOULD, of New York—Mr. President and gentlemen of the convention: At the suggestion of the cattle commissioners, delegated by his excellency, the governor of the state of Illinois, the New York commissioners issued a circular, under the direction of the governor of that state, calling a convention of the different states and the province of Ontario, of Canada, to meet in Springfield, at the prasent time. The circumstances of issuing this call were briefly these: It was found that an alarming and wide-spread plague was devastating the western regions of our country. The proper remedies were not understood; the modes of prevention were not at all comprehended, and it was evident that our flocks and herds would be swept away unless prompt measures were taken.

We, in the state of New York, have one million two hundred and fifty thousand cattle; their value is immense, for it is not merely a value which is represented by their value for food, but we have a vast number of animals worth from three to five thousand dollars for breeding purposes. In addition to this, sir, our flocks and herds are mainly devoted to the production of milk and its compounds. The milk sold and the value of the cheese and butter manufactured in the state of New York, amount, annually, to twenty-five millions of dollars.

I will not attempt, sir, to state the statistics of the great west, for gentlemen who are now present, know far better than I what great interest they have at stake in the preservation and propagation of the cattle which surround us on every hand.

It seemed to us, therefore, that every exertion should be used to learn all that could possibly be learned in relation to this disease—its character, its prevention and its remedies. We learned the value of the old American maxim, that in "union there is strength." Each of us knew something, and we thought that by bringing together our varied contributions, we might, in the aggregate, arrive at a degree of wisdom in relation to these matters, which, acting as isolated individuals or isolated states, it would be entirely impossible for us to reach. Therefore it was that this convention was called together—that was one object. Another matter which interested us, and which developed itself during our investigations regarding this cattle disease, was the condition in which animals are brought to New York; and we believe that the results of those investigations are of the greatest importance to the west as well as to the east.

We found, without any kind of controversy whatever, that cattle were losing from seventy to one hundred pounds in their transportation from Illinois to the state of New York. We found, too, in testimony of the most experienced drovers, that this was entirely unnecessary; that it was a waste of cattle flesh that was exceedingly injurious to the producers here upon the prairies, and equally injurious to us of the east, who need every pound of meat that can be brough to our markets.

It was suggested that laws were absolutely necessary to protect us from the invasion of the plague, and also necessary to protect us against that feverish condition in which our meats reached us, and against the great loss in the weight of cattle which arose from the rapid and cruel transportation of animals, for such enormous distances, without food or drink.

We knew, sir, that it was utterly impossible for any one single state to act alone, where interests were so various. The interests of the farmer, of the drover, of the butcher and consumer, of the small and of the large transporters and producers, and in short, the interests of whole communities, seemed, at first glance, to be so antagonistic, that we felt that unless all of the states con cerned were induced to join in one common system of legislation, the mighty evils to which we have alluded, would continue to affect us. We supposed that nothing could be easier than for a convention of intelligent and trustworthy gentlemen, from each of the states represented on this floor, to agree among themselves as to the best modes of remedying these difficulties—remedying them in such a way as to protect us against the ravages of disease, and at the same time prevent the most perfect freedom of commerce, which was compatible with the safety of our flocks and herds. We supposed, also, that we might easily, after suitable conference, agree upon the terms of a series of propositions which might be submitted to the legislatures of the several states, and be by them put into legal phraseology; that these enactments might be adapted to the various circumstances of the states interested, at the same time securing a substantial commerce in the means to be adopted and the remedies to be applied, in order that one state might work into the hands of another and thus prevent all dissatisfaction.

In order, sir, to accomplish this object, I will, at a proper time, move the appointment of a committee to consider the terms of such a law as I have described—such a law as can be submitted to the various state legislatures, and upon the terms of which we can also agree—and by which, also, some legislative measures may be adopted whereby cattle may be conveyed from Illinois and other western states to New York and other eastern states, without that terrible loss of valuable food which is inevitable incident of the present methods of transportation.

It seems to me, sir, that such a committee, judiciously appointed, may easily bring before us a series of propositions, which, when discussed, and united in, will be adopted, without hesitation, by the legislatures of the different states, and which will be productive of incalculable benefit to the country at large.

I might stop here, sir, but having been requested by many delegates on this floor, who are deeply interested in this cattle disease, to state what we have ascertained in relation to it in New York, I propose to spend a few moments in complying with their wish. I do this for the two-fold purpose of, in the first place, enlightening those who may be ignorant in relation to this matter, and in the second place, of showing gentlemen where the information which we have obtained can be readily and judiciously supplemented by the knowledge acquired by members from the west and from Canada, who will thus see at once, as I proceed, the exact points where they can the more enlighten this assembly, and whereby we can have a full understanding of the matter in all its bearings.

I will, therefore, sir, with your permission, state what I have ascertained to be the external symptoms of the disease—those symptoms which are patent to all. It is very probable that many other symptoms have been observed than those which I shall relate, and if gentlemen who follow me, will supplement the omissions which I make, we shall be enabled, before we are through, to have a complete description of the disease, in all its various aspects throughout the country.

With regard to the external and obvious symptoms. The first thing which we observe is, that the animal drops its head below the level of the back; next, (and this is one of the most important points) that there is a peculiar expression of the eye, which I, at least, have never noticed in any other form of disease whatever, and which I call a stupid stare. Gentlemen who are accustomed to cattle, know very well that there is a staring eye, which is associated with wildness, when the animal is terrified, but this to which I refer differs entirely from that. The next point is roughness of the coat, though this symptom has not always been found in our experience, for some of the sickest animals that I have ever seen have had smooth coats. But generally speaking, this rough coat is one of the characteristics of the disease.

The next noticeable point is the appearance of the urine, which is almost black. A person without any particular experience, regarding this symptom, would say it contained blood, but on microscopical examination it is found not to be blood, but only the coloring matter of the blood. This is, also, however, a rather uncertain symptom. It is true we do find it in a great majority of cases, but in others, and among the sickest animals I have seen, the urine has been perfectly clear and limpid.

The next symptoms are the staggering gait and weakness of the limbs. It seems as though the animals had been attacked with paralysis of the muscles of the extremities, so that when they attempt to go forward they tremble and present an appearance as if walking over glare ice. These symptoms are almost unmistakable, as they have never been met with to the same extent, and presented in the same manner, in any other previous disease.

Again, the spine, in most cases, is arched. Ineffectual efforts are made to dung. This symptom is not always present, but in almost every case this arched back is one of the most positive external characteristics of the disease.

Then comes drooling from the corners of the lips. We often see that, to be sure, in healthy cattle, but the peculiarity of the drooling which characterises this disease, is that the drooled matter is filled with air bubbles, and may be described as a "frothy" drool. Sometimes blood is seen in the stools, but this is very rare, and it can hardly be considered a characteristic of the disease.

Sometimes the bowels are constipated and sometimes very loose, so there is no certain rule as regards that. In every case, however, the bowels are in an unnatural condition.

We sometimes see mucus discharged from the nose, but this, in our experience in New York, is rather an uncommon indication.

A still less common symptom is a yellowish rheum issuing from the eyes. I have seen that occasionally, but it has happened very rarely in our experience.

Now, gentlemen, when we find these symptoms or any other of them, present, we introduce into the rectum or dung, as butchers call it, a thermometer prepared especially for that purpose, a sample of which I have now before me. The animal is held by the nose in a manner well known to us all, and the thermometer, which, by-the-way, is a self-registering one, is introduced into the rectum, and held therefor two or three minutes. Whenever we find the temperature over 103 degrees, two or three of the symptoms above named being also present, you may be absolutely sure that you have a case of genuine Texas cattle fever. This furnishes the crucial test, which has never yet failed in a single instance. Let me give an illustration of the value of this instrument, in determining the presence or absence of the cattle disease. A large number of cattle passed through Amenia, Dutchess county, New York, which were very seriously diseased, and which were arrested by our assistant cattle commissioner there, as being infected with the Texas fever, but on the introduction of a thermometer, the temperature was found not to exceed 101 degrees, which sufficiently showed an error in diagnosis. On examination, it was found that those animals had sickened, not with Texas fever, but with pleuro pneumonia, and on being treated for that recovered.

Now, right here, I wish to impress upon the cattle owners of this great western country, the necessity of using this instrument. By so doing, they will save themselves a great deal of anxiety; it would clear away every uncertainty, and point out unmistakably the proper course to be pursued, for the moment that the thermometer rises above 103, in connection with the symptoms I have spoken of, there can be no doubt of the presence of the Texas fever. If it rises to 107 degrees, that animal must die; it is a sure sentence of death; we may as well cut the throats of those cattle at once, for there is no possibility of their recovery. Between 102 and 105 degrees, it is possible that rest, food and suitable medication may restore them to some degree of health, but, after all, the sooner the animal is destroyed the better, after this instrument indicates the temperature of which I have spoken.

Again, the pulse is very rapid. Generally speaking, it will be found to be 120 strokes in a minute, while in a healthy animal it rarely rises above fifty-eight or sixty, so that when you find this great acceleration of the pulse, you may be sure that the case is one of exceeding gravity.

Finally, if the nose is held over the animal, particularly in the region of the flank, you will detect a peculiar odor, which, once being smelled, can never be forgotten. It is very hard to describe this scent, but I will approximate as near as I am able, perhaps, by saying that it is a decomposed gamey odor—something like that of game which has been kept a little too long.

These complete, as far as we have observed, the external symptoms which indicate the presence of the cattle disease.

I now pass onward to the description of the internal characteristics of the disease, as disclosed upon post mortem examination. The first thing that strikes the eye, upon opening the animal, is the greenish-yellow, and sometimes brownish, appearance of the fat; the lean parts, particularly the muscles between the ribs, are of a dark-brown mahogany color. I think I may venture to say that whenever you find these peculiar appearances of the fat and the lean, the animal has died with the Texas fever.

The liver is almost invariably found to be enlarged, and when cutting into it, the knife blade has a peculiar fatty appearance, as of having cut lard. On examining this enlarged liver, through the microscope, certain small spots will be found, surrounded by an octagonal boundary, with minute lines radiating from these octagonal boundaries to the center, and, on examining carefully, you will see in the center of this octagon, a round yellow spot, which on a still further microscopical examination, is found to consist of bile. These spots are crowded closely together. This is an irresistible evidence of the disease; and, examining through the microscope, we can make no mistake regarding the cause of the animal's death.

We come now to the spleen, where the ecchymosis is always found. The color of the spleen, in a healthy animal, as you all well know, is a beautiful, pearly gray; but, when the animal is diseased, it assumes the appearance of castile soap—white and dark, mottled—the dark parts being of a deeper color than is usually found in the soap. On cutting into the spleen, it is found to be exceedingly dark and black, and almost always there is a thick fluid exuding therefrom. Those of you accustomed to looking at healthy spleens, or melts, I believe they are sometimes called, will have no difficulty in recognizing, in the anterior portion of this organ, a departure from its healthy condition. The enlargement of this organ is sometimes enormous. While on my way to this convention, I found at Buffalo two Texas steers, in the last stages of the disease. On examining the spleens, they were found, by actual measurement, to be two feet five inches long, with an average breadth of five inches and three-quarters, and measuring through the center three and one-quarter inches. This enlargement of the spleen is an inevitable concomitant of the disease, and this, as I have said in regard to the liver, indicates it unmistakably.

The kidneys do not present so great regularity of appearance. Sometimes they present a tolerable healthy appearance, while at other times they are found, when cut into, to be filled with a dark, bloody matter, generally somewhat darker than is natural. Still, this is not very common.

The third and fourth stomachs are more or less inflamed, and it may be proper to enter rather more fully into the description of their appearance. The manifolds generally contain, as is found in turning over the leaves, half digested food, in a very hard condition. In the Texas steer, which we dissected at Buffalo, we found that every leaf was covered with small, round and very hard substances, having the appearance of gun wads—the gun wads gradually diminishing in size from the outward to the inner. These substances adhered so tenaciously that whenever they were pulled away the lining membrane was also torn away from the stomach with them. This may not always occur, but usually the digested food in the manifolds of a healthy animal is much softer and of less consistency than it is found to be in an animal diseased with the Texas fever, when it is always harsh, hard and dry.

We come now to the last stomach—the obomassum or rennet. The upper part of that stomach consists of folds, arranged as a lady's scarf is folded. Generally speaking, a considerable portion of that is found to be a very dark red, and in the tops of the folds there are sulcations which, in most cases, are filled with a sort of clotted blood.

Descending to the lower part, near where the stomach communicates with the smaller entrails, we find four or five inches of that, presenting the appearance of Russia leather, having large papillæ ascending from the surface, the color of which, in the natural state, is about as near the external color of this capitol as anything I can think of, and which has no appearance of ulceration whatever. But, in diseased animals, you will invariably find deep ulcerations in this portion of the rennet, and nothing is more characteristic of the disease than these same ulcerations. In the Texas animal examined at Buffalo, we found a large ragged ulcer, two inches long and an inch broad, the ends of which had been drawn inward in such a way as to raise up the surface, and cause the ulcer to be fully half an inch deep. This is the largest one that I have ever seen, but they will be found in almost every period of the disease, scattered over portions of the stomach.

The rectum is generally inflamed, and that in longitudinal lines, about an inch apart, through the whole of it. The lower part is generally completely engorged with blood, in a very high state of congestion.

These are, then, the internal indications of the Spanish fever.

Coming to the blood, we find that it is generally lighter than usual, and, under the microscope, many of the blood discs are found to be not perfectly round, but presenting an appearance as though saw teeth had been cut into the edges, one-half appearing to be cut off. In other words, we have seen them like the new moon, the serrations being in the interior of the curve. These peculiarities of the blood discs are very marked under the microscope.

Speaking chemically in relation to the blood, the Spanish cattle disease may be described as one which destroys the blood corpuscles, substituting water for blood. My memory for numbers is not very good, but my impression is that our New York chemists have found the blood of animals suffering under this disease to contain eight hundred and seventy parts of water to one hundred and thirty of blood, taking one thousand as the basis. This is one of the most striking features of the disease.

The bile is generally thickened. As expressed from the gall bladder of a healthy animal, it is very fluid and limpid, but in a diseased animal it has a tarry appearance, flowing in flakes.

I come now to a point which has been observed with a great deal of care and minuteness by the board of health of the city of New York, headed by Dr. Harris, and by the board of health of Chicago, headed by our honorable member Dr. Rauch. A minute point has first been observed in the blood, which after a time, enlarges, and presents an ear or kidney-like shape. It then still further enlarges, continuing, however, of the same general form, but having two nuclei. My friend, Dr. Morris, the assistant commissioner from New York, will give you further information on this point, and I simply alluded to it, in order to lay the foundation for certain general ideas which I wish to impress upon the minds of this convention. This minute spore, when transplanted from the subject to an apple, the rind of a lemon, or any other similar object, and kept at a temperature of ninety-eight degrees, grows and develops very peculiarly; and in regard to this, also, my friend, the Doctor, will have something to say. The growth of these spores has enabled the scientific men of our commission to determine with accuracy this—that they belonged to the ordian family—which is the same as that to which mildew found on the grape leaf belongs. The genera, and species, may be said to be the tilletia caries.

The heart and lungs generally present a healthy appearance, though there are some exceptions to this rule. So far as our experience has gone, the lungs, especially, are generally in a sound condition.

The brain is occasionally softened. In the bullock examined at Buffalo, to which I have already alluded, the brain, from the surface to the corpus callosoum, was so softened that it could be scraped out with the finger, as one would scrape out batter. The surface of the brain is injected with venous blood, and presents also a very marked appearance.

Another very remarkable discovery made by post mortem examinations, and one very well worthy your consideration, is this: that on handling the viscera of an animal that has died from the Texas fever, the hands are affected with a smarting sensation very similar to that produced by dabbling in mustard water. I know of no other instance in which the handling the remains of a diseased animal is attended with this peculiar sensation.

I have now given you an exact description of the external and internal manifestations of Texas fever, so far as we have observed them in New York.

I understand there has been some question at the west as to whether Texas cattle ever do have this disease, and we have been told, again and again, that they do not. I need not repeat the remarks that I have already made, but I would like to say that during the past week I have seen two Texas cattle as sick with it as any animals I ever saw. We have the testimony of Prof. Gamgee, who saw six Texas cattle laboring under this fever. Ninety-four Texas cattle were slaughtered in New York, early in September, which presented unmistakable evidences of the disease. We, ourselves, while on our way hither, stopped at LaFayette, Indiana, where we saw one hundred and forty-two Texas cattle slaughtered, and we found that, although they were in a healthy condition at that time, there were unmistakable marks of the disease. You, yourselves, this morning, at the slaughter house, saw the unmistakable evidences of disease presented by the animal there killed; and on comparison of that animal with the native animal killed immediately afterwards, you could not but have seen the difference between them. I therefore need not dwell, as otherwise I should feel it my duty to do, upon this topic, after all this proof which shows so conclusive that Texas cattle can have this disease.

You may ask me why it is that so many individuals, familiar with Texas cattle, should take the stand which many of them do in regard to this disease. My answer to this would be very simple. You know that Indians are said to be hardier than we are. Bring an Indian here and he will run farther than any of us, hold a weight much longer, and be less liable to very many diseases.—I say that the reason of all this is that the Indians are so exposed, and undergo so many hardships during infancy, that those who have any weak spots soon die. So it is with the Texas cattle; they get no consideration; the calf is obliged to fight the battle of life for itself, and if too weak to do that must die at an early age. Therefore it is that these cattle, being so strong and hardy a set of animals, are better able to contend with the disease than our more delicate breeds. But, that they do succumb to this scourge, in numerous instances, cannot be doubted.

It has been alleged, and generally believed by most gentlemen here, that native cattle cannot communicate the disease to native cattle. We in New York know that this can be done, and as this is a matter of particular importance, and one in regard to which no observation has been particularly made at the west, I will, with your permission, read a carefully prepared statement of certain circumstances which occurred in Orange county, New York, which I will myself verify, for they all occurred under my own immediate observation.

On the 25th day of August, 1868, a lot of forty-four cattle arrived in Goshen, at about six o'clock in the morning, which had been purchased in Buffalo, by Charles H. Church, for John Hodge, of Goshen. Mr. W. Church, the father of Charles, alleges that the whole lot was purchased of a man named Gridley, who lives about ten miles from Painesville, Ohio. Mr. Hodge, the owner of the cattle, says, on the other hand, that sixteen of them were picked up at Buffalo—their place of origin being unknown. He admits, however, that twenty-eight of them were purchased near Painesville, and had been owned by the farmer of whom they were purchased, over a year. There was one steer in the lot; all the rest were cows or heifers. It is certain that there were no Texas or Cherokee cattle among them. On their arrival, there was no symptom of disease observed among them. The cow that subsequently died was carefully examined by three different buyers, within two hours after her arrival. They were experienced men, and each of them made offers for her, but the price was not such as Mr. Hodge thought she ought to be sold for. He has been in the cattle trade for over thirty years, and is thoroughly acquainted with the usual signs of a healthy condition in cattle.

It is clear that if Mr. Hodge had suspected that the cow had been diseased, he would have sold her at the price offered; and if the buyers had suspected disease, they would not have made the offers that they did, which were seventy, seventy-two and seventy-five dollars, respectively.

At ten o'clock, A. M., Mr. Hodge discovered for the first time, that the cow appeared weak in the knees, and staggered slightly when she walked. By eleven o'clock, A. M., these symptoms were aggravated, and Mr. Hodge drove her into a small lot by herself. This lot was bounded on one side by a low stone wall, standing on the edge of a steep hill, the foot of which adjoined the public road. Mr. Hodge being busily engaged in selling the remainder of the cattle, he paid no attention to her until four o'clock, P. M., when word was brought to him that the cow was lying in the road. On going to her, he found that the wall had fallen down, and the marks on the side-hill showed that she had slidden down it into the road. He infers that she fell down suddenly, throwing down the wall. He then put her into a stoneboat and had her drawn to a small orchard, by a pair of oxen. She lay there until about six o'clock, P. M., when she died. She was a grade Devon, and was within about four weeks of calving, and had been on the cars thirty-seven hours, without food, drink, or rest. She was buried about two feet deep, but swelled so much after death that she could be plainly seen. No symptoms of disease, other than those already mentioned, were discovered previous to her death.

On Saturday, the 29th of August, William Morel, of Montgomery, Orange county, N. Y., purchased two cows out of this lot of Mr. Hodges, reserving the right to return them if he did not like them on trial. The purchase was made late in the afternoon, and he therefore left them that night at the farm of his brother, John Morel, of Hamptonsburgh, who turned them into the pasture with his own cows. *These were the only strange cows that they ever had been in contact with.*

On Tuesday, September 1, William Morel removed the two cows to his own farm. After keeping them some days (the precise number does not exactly appear,) he returned one of them to Mr. Hodge, saying he did not like her as well as he expected to, but not alleging any sickness as the cause of the return. Mr. Hodge then resold her to another person, who also was dissatisfied with her, and returned her; but did not allege ill health as the cause of his dissatisfaction.

The cow that Wm. Morel retained died on Tuesday, the 8th day of September. Her milk began to diminish two days before. On the day of her death she appeared weak in the knees, and staggered in her walk. After her death bloody matter was found upon the ground. This is all the information we have been able to obtain respecting the death of the second cow.

The cow which William Morel returned died on the 11th of September. Nothing unusual was observed about her. The first knowledge that Mr. Hodge (who then owned her) had of her being diseased, was when he found her dead in the lot. This was the third cow, of the original importation by Mr. Hodge, that died, and we cannot find that any others have died up to this time, November 1st.

On the 12th of September, one of John Morel's cows, which had been in the pasture with the two cows which William Morel brought there on the 29th of August, was taken sick. She had been drooping for some days before, and had fallen off in her milk. On the morning of the 13th her milk was entirely gone. Her head hung down below the line of her back. She was weak, and staggered very much when she attempted to walk. She lay down and got up frequently, and was restless and uneasy. Some time before her death she was in great distress. She was very thirsty, and ate hay with an apparent relish within a short time of her death. She died about two o'clock P. M., on the 13th.

On the 14th of September, another, and the the second of John Morel's cows, was taken sick, which somewhat alarmed him, and he paid more particular attention to the symptoms than he had done before. She had the hoof ail about two weeks before, but had recovered from it. On the night of the 15th she gave a larger mess of milk than she had done since she had the hoof ail. On the morning of the 15th, her coat was rough; all the hairs seemed to stand upright. Her head hung down and her ears were flabby and drooping. Her milk was entirely suppressed, her urine was nearly black, her bowels were loose, and the stools were very offensive and almost putrid. She staggered in her gait, lay down and got up often, was very thirsty, and died towards evening on the 15th of September.

On the morning of the 18th, John Morel found his third cow dead in the lot. She was observed for four days previously to be falling off in her milk, and to be somewhat drooping. On the evening of the 17th he gave her some medicine, and the next morning found her dead, as above stated.

On the 21st, an ox died at Hamptonsburgh, which belonged to Mr. Hodge, and which had been employed in hauling away the carcasses of the first and third cows that died of the original importation. He had also got into the orchard in which the first cow died, and remained in it all night. All that could be learned of his symptoms was, that after death his rectum was protruded, and was very red.

Another ox, that had been employed in hauling away dead animals, was taken sick, and remained ill for two days. He then began to recover, and in about ten days he was deemed fit for work by the owner, but has not been used since.

These seven deaths seemed to excite no alarm among the inhabitants. The weather was exceedingly hot, and most of the deaths were popularly attributed to milk fever.

John Morel had the second cow opened, and he says the lungs were out of order. The ox was supposed to have died in consequence of being choked by an apple from the orchard where he was pastured.

These facts, or rather the rumor of them, reached the commissioners about the first of October, when D. Montfort, of Newburgh, was appointed an assistant commissioner for the county of Orange. He visited the localities which had been the seat of the disease, but found no evidence sufficient to show that it was the Texas fever.

Later rumors began to circulate that it was the Texas fever; whereupon Mr. Gould, the commissioner residing in the eastern district, accompanied by assistant commissioners Morris and Montfort, went to the localities, and, by carefully questioning all the parties, there appeared to be the strongest probability that these cattle had all died of the true Texas fever. As no cattle had died or been sick for four weeks previously, it was confidently believed that the disease had spent its force, and that no more danger was to be apprehended. The parties were, however, strictly enjoined to give the earliest possible notice to Dr. Montfort, should any further appearance of the disease be manifested.

On Saturday, the 24th of October, John M. Morel, of Hamptonsburgh, residing on what is locally known as the "Purgatory Farm," found two of his heifers dead in the pasture lot. They had been running for some time on Mr. Church's pasture, in which the third cow of the original importation, and the ox that died, had run. On Sunday, the 18th of October, Mr. Morrel brought them to a small pasture, where he observed them closely until Tuesday, the 20th, when he turned them on to a lot on his own farm. From this lot, they had ready access to Mr. Church's lot, and to which they went almost immediately, and remained there. The last time that Mr. Morrel saw them was on Friday, the 23d, when they were feeding on the hill-side, apparently well. He found them dead between one and two o'clock on Saturday. Dr. Montfort was immediately notified, and accompanied by Dr. Morris, assistant commissioner for New York, who had great experience in the disease, and who carefully examined these. They pronounced the post mortem appearance precisely those of the Texas fever.

Dr. Morris carried specimens of the blood, bile and tissues of the diseased animals to New York, where Dr. Stiles gave them a careful microscopic examination, but failed to find the characteristic cryptogam in the blood or bile, or yellow circle in the centre of the lobules of the liver. After the examination, the bodies were carefully burned, under the direction of the assistant commissioner.

On the morning of the 26th, Mr. Gould arrived in Goshen, and remained there until noon of the following day. He visited all the localities where disease had manifested itself, and quarantined the cattle that had been exposed to the diseased animals. He also published a set of plain directions to farmers to aid them in preventing the spread of the disease, and to treat it when it appeared, which was published in the county papers.

The next case occurred on the farm of John Morel, at Hamptonsburgh, on Monday the 26th of October. Mr. Morel says that at first he would have hardly noticed anything wrong, if his fears had not been excited by previous deaths in his herd. As the day wore on the symptoms were aggravated; the back was arched, and ineffectual efforts were made to evacuate the rectum. She was very restless; walking a few steps and then stopping. At night she gave a fair quantity of milk. On Tuesday morning she was in an apparently dying condition, and at half-past seven o'clock in the morning she was dead.

At half-past three o'clock, Dr. Montfort arrived at the farm and made a post mortem examination, of which he makes the following report:

"Flesh very dark; fat of a reddish-yellow color; lungs perfectly healthy; heart healthy; spleen enlarged to three times its natural size, and filled with blood; liver slightly enlarged, and fatty; kidneys healthy; fourth stomach at pyloric extremity reddened and inflamed with ulcers; mucous membrane peeling off readily; bladder entirely empty and contracted—feeling almost like a ball; rectum very much inflamed; mucous membrane softened."

The animal having been confined in a stable, Dr. Montfort ordered it to be thoroughly disinfected with the Henny carbolic oil, and all cattle to be excluded. The remainder of the herd were confined to one pasture.

This completes the history, and I think you will agree with me that it shows most satisfactorily that the genuine Texas fever may be transmitted from one native animal to another. It is true that this is an unfrequent occurrence, but having happened once, it may occur again under special conditions calculated to promote it, and we ought, therefore, to keep that possibility clearly in our minds while determining the draft of the legislative provisions intended to prevent its spread.

I come, now, to this question: What is the real essence of this disease? Why is it that a certain plant causes the destruction of the animal? Now, gentlemen, hitherto I have been on impregnable ground. It is possible that, regarding what I am about to state, there may be differences of opinion.

You are all aware, gentlemen, that the term mycelia, when speaking of cryptogamous plants, has the same meaning as the word roots, when applied to other species of plants. When we speak of mycelia, we speak of roots. In examining these objects under the microscope, we have never yet seen any mycelia; but I have no doubt, and I think none of us can doubt, but that mycelia exists in these, for the reason that all other cryptogamous plants do have mycelia.

Again, in examining blood discs at various times, Dr. Stiles has found that they were perforated with minute holes, as though they had been worm-eaten, and that, when thus worm-eaten, they always diminish in bulk and size. As Dr. Morris will show you, when exhibiting the microscopic appearances, these objects appear like minute dust, like the prick of a pin. You will see that, as this microscope magnifies five hundred times, it follows that these must be the size of the five-hundredth part of the prick of a pin. As I said before, these minute drops, after a little time, enlarge and present an ear-shaped appearance; after which, enlarging still further, two nuclei are discovered. Now, gentlemen, it is perfectly obvious that nothing can gain in bulk by the creation of its own matter, and if a growing body does increase in size, it is perfectly plain, and beyond the shadow of a doubt, that this increase must be gained from some source exterior to itself. My own opinion is (and I only give it as an opinion, though it seems to me that no one can arrive at any other conclusion), that these mycelia penetrate into the blood discs, which are the very life of the animal, suck out its substance, and appropriate it to their own growth. In other words, that the growth of these plants is at the expense of the blood discs themselves.

There may be an additional cause. We are perfectly familiar with the action of yeast in solutions of sugar; and we know, equally well, that yeast is simply an aggregation in fluid of these minute cryptogamous plants. These yeast plants grow by feeding in the sugar, appropriating the substance of the sugar to themselves; then, when they have obtained all that they need for their own transformation, they excrete the substance known as alcohol.

Now, it may be possible that this plant, after feeding in the blood discs, may not require all the substances contained therein, and may, like the yeast plant, excrete some poisonous matter which may operate as a specific poison of the blood. In addition to the absorption of its nutritive properties, you may take either, or both, of these conjectures as an explanation, and one or the other, or both, account, it seems to me, most satisfactorily, for the fact that the growth of these cryptogams in the blood is the cause of this dreadful phenomenon.

I move my arm, and some minute part of the muscles is destroyed. In order to maintain my health a provision is made, whereby the wasted part is carried off through the circulation, by which the blood is purified, passing through the heart and lungs and is finally carried away. At the same time, in a healthy condition of the body, when a particle of disused matter is carried off by the current of the blood, the arterial blood darts in and a fresh particle replaces that which was destroyed; so it is in the hair, the eye and every other tissue of the body. The integrity of health, therefore, depends on the existence of pure blood in the body, and on the power of that blood to reproduce the wasted tissues of the system. When, therefore, a diseased animal moves, there is no drop of pure blood, whereby the vacancy may be filled; and when the effete and wasted portions are carried off, there is nothing to replace it; consequently the animal dies from waste and inanition. This disease has its foundation in the destruction of the blood, causing that decay in every portion of the body which I have described. It produces that fatty disintegration of the liver, the breaking down of the spleen and all the phenomena which I have described.

The next question that may be of interest is this—how is this disease communicated? How is it these pores pass from the sick animal to the healthy animal and there take root and grow? There are various ways. I will not repeat what I have said to you regarding these spores, for I know you all understand what I have been saying. These spores are thrown out in the dung, urine, or any other excretion, and by and by we find them in every part of the body. Not merely the blood, but the bile, the urine, and all the tissues of the body, are found to be overflowing with them, each little plant striving to gain some nutriment from some important organ of the body. Again, these spores find a genial home within the sheaths of a great variety of grasses. They take root there and completely over run them, so that a large area may become absolutely poisoned by the growth of these minute spores. When the cattle crop this grass, it is very easy to see how, entering into the stomach, these minute objects may be introduced into the circulating current of the blood, and thus become infused through the whole body.

We have tried this thing artificially. A great number of subjects have been fed upon small pieces of the diseased liver, spleen, etc. Some animals have been affected one way and some another. We have not gone through these experiments as thoroughly as we desired or intended to do. Thus far, we have only been able to reproduce the Spanish cattle fever in rabbits, but that we can do, with absolute certainty. After feeding for a few days on these spores, the rabbit has all the symptoms of the real cattle fever, and on dissection, the bile, blood and urine are found perfectly loaded with these spores. It seems to me that we have thus demonstrated the real foundation of this disease, but as this subject will be much more fully entered into by Dr. Morris, I will not go into details.

The question is sometimes asked why it is that Texas cattle will sometimes give the disease, and at other times will not. All of you, undoubtedly, have come prepared to detail to us most marvelous instances of this kind, for I have heard of such, all through the country, and from all classes interested in the subject. Take, for instance, the case of Mrs. Duke, of Kentucky. One hundred Texas steers were brought to her for pasture, and were pastured for three or four weeks, after which they were sold to a neighbor. She then turned in four hundred head of her own cattle, every one of which, after grazing upon these grounds, died. But Mr. Duncan, who purchased the cattle, put them on his own fields, with his own animals, and not a single one was afflicted with the disease.

The explanation of this is very satisfactory to me. I can very well understand how the fresh, green pastures, and the cool, flowing waters of Kentucky, washed out all these spores from the animals, and, having thus become pumped, they were incapable afterwards of transmitting the disease.

You will recollect that in describing these cryptogamia, I have spoken of them as in various stages and conditions of development, but the spores must be in a given condition before they will develop into the large plants I have described. So, with Texas cattle; they may be full of these spores, which, however, may not be in a condition to develop themselves, and then their excrement has no hurtful quality, and our native cattle may pass over after the Texas cattle without any sort of danger. It is only Texas cattle who have the spores in their own bodies in such a stage that they may be developed in any other animals that are capable of communicating the disease.

Why is it so rarely the case that native cattle commucicate the disorder? It is because the native cattle do not, in ordinary cases, develop these spores at the point where they are susceptible of propagation. That is the plain and obvious reason why these discrepancies exist, and why is it that sometimes Texas cattle will surely communicate the disease wherever they go, while at other times there is no danger whatever. I pass over these matters with as much brevity as I can, and I shall be very happy at some future time to explain the matter which gentlemen may desire, and in regard to which I may have omitted some point.

I now come to the most important inquiry of all, as to whether there is no mode of arresting contagion from Texas cattle; and, I am more than happy, gentlemen, that it is in my power to state, with a great amount of confidence, that we have such an agent. I have here before me specimens of carbolic acid, in various preparations, some containing forty per cent., ninety per cent., and here, in the third bottle, the heavy oil containing about fifteen per cent. It is to this remedy that I wish to call the attention especially of the farmers of the west, for I do believe that they have in it a real and true friend.

It is wonderful what the influence of this carbolic acid is; and I don't know that I can better illustrate its wonderful power than to tell you the effect it produced at the bone-boiling dock in the city of New York. The most of you must know the intolerable stench generally issuing from such a place. I have seen there twenty horses brought in at once, in various stages of putrefaction reeking with unbearable odors. I have sprinkled lightly over them this acid, and the whole of this disgusting effluvia was gone at once. Put those putrefied and corrupt bodies—horses, pigs and hogs—into the boiling-tank, and there is not the least odor therefrom. The fat is all tried out, and there is no more scent of that corruption than there is scent of corruption in this assembly to-day. Take one of those stinking livers out of the furnace in which it has been tried out, break it open, and hold it directly under your nose, and you will pronounce it perfectly sweet.

Gentlemen may smile, but it is a positive fact; and if you will only try it, you will find my statement verified.

If I am correct, gentlemen, as far as I have gone, and if I have succeeded in satisfying you with regard to the true nature of the disease, it follows that if we can destroy these spores, which I have shown to be the true cause of the disease, as I believe, we blot out the cattle fever. And I here state, gentleman, that carbolic acid will destroy these spores. If you can only moisten them with this acid daily, you will render them utterly incapable of propagating themselves. The difficulty, of course, is, that you cannot thus go over your fields and pastures.

The expense of the dead oil it but a trifle, for it is sold in the city of New York at eight cents a gallon.

Gentlemen, I have some notes here with regard to the value of this antiseptic, and as I believe they will be of interest to you, I will, with your permission, read them:

The advantages of carbolic acid over other allied substances are, that it destroys the causes of the disease, while the others are mainly concerned with its accessories. A small quantity of it answers the purpose. It is cheap. It is volatile, and therefore attacks the minute spores that are floating in the atmosphere, and are the chief disease-producing agents.

I have given a conjectural theory of the disease when speaking of its essence, but it is by no means certain that it is the true one. Yeast is the ferment with which we are most perfectly acquainted. This plant, as I have said, feeds upon and assimilates the sugar contained in the fluid, where it grows, and throws out alcohol as an excrement. There may possibly be a similar excrement from this plant, which is believed to be a *Tilletia*, and the morbific virus may be this excrement.

However the true source of the morbific virus may be subsequently settled, it is certain that carbolic acid destroys the vitality of the plant, and thus arrests the propagation of the disease. It is not yet fully settled that it has the power to arrest the ravages of the disease when it has once obtained lodgment in the body of the animal. In other words, it is not known to have the power of restoring or replacing the broken-down blood corpuscles, or of rendering the specific poison (if there be any) innocuous.

The following experiments by Mr. Crooks throw much light upon the action of carbolic acid on vegetable and animal tissues:

1. Some meat was hung up in air till the odor of putrefaction was strong. It was then divided into two pieces. One was soaked for half an hour in chloride of lime solution, and was then washed and hung up again; the offensive smell had entirely gone. The other piece of meat was soaked in a solution of carbolic acid, containing one per cent. of the acid; it was then dried and hung up. The surface of the meat was whitened; its offensive odor was not removed, though it was masked by the carbolic acid. In two days' time the bad odor had quite gone, and was replaced by a pure but faint smell of carbolic acid. In a few weeks' time the two pieces were examined again. The one which had been deodorized by chloride of lime now smelt as offensively as it did at first; whilst the piece treated with carbolic acid had simply dried up, and had no offensive odor whatever. It was then hung up for another month, and examined; no change had taken place.

2. A piece of fresh meat was soaked in one per cent. aqueous solution of carbolic acid, for one hour. It was then wrapped in paper, and hung up in a sitting room in which there was a fire almost daily. At the end of ten weeks it was examined. It had dried up to about one-fourth of its original size, but looked and smelled perfectly good and fresh—a very faint odor of carbolic acid being all that was perceptible. It was soaked for twenty-four hours in water, and then stewed, with appropriate condiments, and eaten. It was perfectly sweet, and scarcely distinguishable from fresh meat, except by possessing a very faint flavor of carbolic acid, not strong enough to be unpleasant.

3. Cheese-mites were immersed in water, where they lived several hours. A few drops of a solution of carbolic acid, containing one per cent., added to the liquid, killed them instantly.

4. An aqueous solution of carbolic acid was added to water in which a small fish was swimming. It proved fatal in a few minutes.

5. A very minute quantity of a weak solution of carbolic acid was added, under the microscope, to water containing various infusoria, such as bacteria vibrios, spirilla, amœbæa, monads,

englenæa, paramecia, rotifera and vortecellæa. The acid proved instantly fatal, arresting the movements of the animalcules at once.

These animalcules are the almost invariable accompaniments of putrefactive fermentation. The above experiment has been tried with putrid blood, sour paste and decayed cheese, and in every instance the destruction of vitality and the arrest of putrefaction have been simultaneous.

6. Caterpillars, beetles, crickets, fleas, moths and gnats were covered with a glass, the inside of which was smeared with carbolic acid. The vapor proved quickly fatal. Dr. Elisha Harris confirms the deadly effect of carbolic acid on the common house fly. Dr. Lemaire and other observers testify to the effect of it upon ants and their eggs, lice, bugs, ticks, acari, musquitoes, aphides, butterflies, earwigs, wood-lice, cock-chaffers, centipedes, and other insects of this size.

These examples show with sufficient clearness that carbolic acid has a very remarkably destructive effect upon the minuter forms of vegetable and animal life, and that it may be fully depended on to destroy all the fungi which are the causes of putrefaction.

There is a strong analogy between the European disease known as the rinderpest and the Texas cattle fever: both of them seem to be caused or at least associated with a growth of minute fungi in the blood and in the bile. Whatever influence therefore is proved to be exercised by carbolic acid over one disease, may be fairly inferred respecting the other. It is therefore instructive to know that in a shed very greatly infected with the rinderpest, the air was drawn through glass tubes containing trifts of cotton wool, in the expectation that some of the virus cells, supposed to be floating about in the atmosphere, would be arrested by the wool. The suction was continued for ten minutes. One piece of the infected was then exposed for half an hour to the vapor of carbolic acid. Two apparently healthy calves were selected, and an incision being made beneath the skin, these pieces of wool were respectively inserted in each. The animal thus inoculated with the infected wool, which had been exposed to carbolic acid, remained perfectly well, but the other animal took the disease, and died in a few days. It is possible that the calf that died might have contracted the disease before the inoculation was made. We admit that the proof of the protective power of this acid, in this particular case, is not as strong as it might be, but as it is the only case of inoculation that has come to our knowledge, we give it for what it is worth.

The influence of carbolic acid in protecting cattle against the ravages of rinderpest, were very decided. No cattle, thoroughly and persistently protected by it, ever had the disease. As an example of a great number of cases, we give the following statement of Mr. Crooks, respecting the farm of Mr. Spence, at Smedley, near Manchester:

"I arrived here in December last, and instructed the attendants in the management of the disinfectant plan with carbolic acid and sulphur. It has been regularly carried out ever since. In January last the disease first appeared in the immediate neighborhood, and carried off about a dozen cattle from a farm, the sheds of which were not more than 500 yards from Mr. Spence's cows. A short time after, thirty beasts, 750 yards off on another side, were attacked, and the whole were swept off in rapid succession. A month ago the disease appeared amongst twenty-two in another direction, not more than fifty yards off, and the whole of these also died. Through all these cases occurring around him, the cattle of Mr. Spence, protected by carbolic acid, escaped the contagion."

A still more remarkable example of the protective power of carbolic acid is given by the history of its action on the cattle of Mr. Lowe, Smethweck Hall, Brereton, Cheshire, England:

"This farm is in the centre of one of the most affected localities in England. The stock consists of seventy-three animals; forty-five milch cows, kept in houses which have been regularly disinfected since December last; and fifteen two year old heifers, and thirteen yearling calves, kept in fields and open sheds. To these latter no disinfectant whatever has been used, owing to the impossibility of applying it satisfactorily to animals in open air.

The disease prevailed very severely all round, but no case occurred at Mr. Lowe's farm until February, when one of the forty-five milch cows showed signs of illness. Immediate investigation was made, and it was found that one of the cow-men on the previous day had attended a post mortem examination of some diseased beasts, and having come directly to Mr. Lowe's house, afterwards had milked some of the cows. The man was, of course, discharged instantly. The succeeding day, February 20, the first cow that the man had milked, on the day of the post mortem, refused her food, and all the symptoms of the plague rapidly appeared. Two others in the same house were afterwards attacked, one of which recovered almost immediately and one was killed as a matter of precaution. A fourth case then occurred in another shed. On inquiry, I found that the first, third and fourth cows were those which had been milked by the discharged man. The second case, occurring in the same shed with the first and third, was evidently either developed from them, or was a case of infection brought from the calves mentioned below. These four cases are all that have occurred amongst the forty-five milch cows in the disinfected sheds. Up to the present date (April 25, 1866) the rest are perfectly well. Their health indeed seems to be improved by the carbolic acid. The cows are very fond of it, and lick it from the wood-work or walls whenever they have an opportunity.

Previous to his discharge, and on the morning of that day, the same man was employed in preparing food for and feeding the unprotected fifteen heifers and thirteen calves. A few days after the disease developed itself among them, and in a fortnight they were all dead.

A crucial experiment has therefore been tried at this farm on the grandest scale. It was indeed supplied by accident, but it is none the less satisfactory and decisive. Although it far surpasses in magnitude any trial which an experimentalist dare institute, it fulfills every condition which could be demanded by the most rigid investigation. A farm is chosen in the very hot-bed of cattle plague. The cattle on it are divided into two lots, forty-five being placed in disinfected houses, and twenty-eight in undisinfected open sheds. The disease is brought into each lot on the same day, by direct inoculation of the virus. Of the disinfected animals only those actually inoculated fall a prey, while of those which are not protected by disinfection the whole are rapidly swept off. It is scarcely possible to say anything which will add to the satisfactory nature of these results; but I may mention that of the ten farms immediately surrounding Mr. Lowe's, seven have lost the whole of their stock (amounting to 215), whilst on the remaining three the plague is gradually spreading through the herds.

Accident has carried this grand experiment a step further, with most striking results. A few weeks ago the remainder of Mr. Lowe's forty-five disinfected animals were turned out to grass, and at the same time were removed from the protecting influence of carbolic acid. Within a few days the plague attacked and killed the whole of them. The complete proof of the value of carbolic disinfection, which has been afforded at this farm, is cheaply purchased at the loss of all Mr. Lowe's stock."

In this connection, I will state that the earliest herds affected, arriving in New York, were those sent forward by Mr. Alexander from Homer, in this State, Many of the animals were killed, and the few that Mr. Alexander had sold, he purchased back the moment he was acquainted with their sickness. Six of these animals were left in Jersey for an experiment. Though very much diseased, the experiment was tried of feeding them this carbolic acid, together with glycerine and soda, diffused through water so that it tasted very perceptibly. Careful chemical experiments were made each day after their being fed on carbolic acid. After the fifth day it was found that the fibrine of the blood was being renewed, and with each successive day that the treatment was continued the fibrine increased until nearly the normal amount was restored, the animals becoming perfectly well. I do not say that this is a cure, but I do think that instance illustrates very clearly the power of carbolic acid in arresting the disease. At all events, if it is not considered, as I do not consider it conclusive in the matter, it is well worth the while of every western farmer to supply himself with a barrel of this acid, which does not cost a great deal, and try the experiment himself. I find that I am getting exceedingly tedious, but I wish to say this in regard to the influence of this acid upon the rinderpest—that where cattle were surrounded on every hand by that disease, the hanging up of rags which had been soaked in this acid, through the stables where they were, entirely protected them. I do not think and do not believe it possible that cattle sick with the Texas fever, could under any circumstances, communicate it to others, where the odor of carbolic acid is constantly diffused. At all events, we may state, as matter of fact and not as an opinion, that no animal has ever died where it has been faithfully used. It is also a very efficient remedy in many diseases and a specific for some. It is the best remedy for foot-rot in sheep that has ever been discovered. This, of itself, ought to be a sufficient inducement to you all to keep it constantly on hand. It is also the best remedy for ticks and scabs ever known, and especially with regard to these ticks I will say, since there has been so much talk of them in connection with the Texas fever, that they are killed as by a shock of electricity simply by rubbing lightly over them this same acid. It is one of the best of remedies for pleuro-pneumonia. It is also almost a specific for glanders in horses—the worst cases have been cured by it. For foul ulcers it is one of the most reliable of all remedies. If you desire to destroy the unpleasant odors around your slaughter houses or privies, a very small amount of this carbolic acid will do it effectually, and that, too, for a month. Dr. Snow, one of the secretaries of this convention, who is the health officer of the city of Providence, has used it to a great extent in the disinfecting of drains, and he will add his testimony to mine.

In addition to this, it is a sovereign remedy for the whooping-cough, entirely removing those terribly paroxysms which are so much dreaded.

Now, in regard to the periods of incubation. I have obtained the following data:

Texas cattle were received on the Broadland's estate on the 31st of May, and no disease occurred among the native cattle until July 26th, a period of fifty-six days.

Col. Sullivan's cattle *via* Red river were received June 2d, and the disease did not make its appearance until Aug. 2—sixty days.

Mr. Gregory put Texas steers into a pasture with fourteen native steers on the 20th of June. The first of fourteen died on the 10th of August—fifty-one days.

Mr. Gregory put forty head of native cattle with the Texas cattle, on the 29th of July. On the 15th of August the first of the forty died—seventeen days.

John Morrel's first cow was exposed on the 29th of August; died on the 13th of September—fifteen days.

J. Morrel's second cow, exposed on the 29th of August; died on the 15th of September—seventeen days.

J. Morrel's third cow, exposed on the 29th of August; died September 18th—twenty days.

We have up to the present time no evidence that the disease manifests itself in less than seventeen days or more than sixty days after being exposed to the infection. Hence cattle that have been exposed to the disease should remain in quarantine for a period of at least sixty days.

Since considerable inquiry has been made in relation to them, and I have been requested to present them to the convention, I will now read our instruction to farmers; they are follows:

1st. When the disease makes its appearance in any neighborhood, all the owners of neat cattle should make a point of examining each animal every morning. The chief points to which their attention should be directed, are the following:

The head; whether it hangs down, whether the eyes are dull and staring, whether the ears are drooping, whether the horns are hot or cold.

The coat; whether it is rough or smooth.

The urine; whether it is a dark red or black.

The hind legs; whether the gait is staggering and whether the knees seem weak.

The dung; whether it is natural or otherwise, and especially whether the animal arches its back and makes ineffectual efforts to dung.

See if there is any drooling of frothy matter from the lips.

If you have a fever thermometer, insert it into the rectum (bung), let it remain until the mercury ceases to rise, then note the temperature. If it is 102° Fahrenheit, and any of the above mentioned symptoms are present, you have good reason to suspect the presence of the Texas cattle fever, and the probability is increased by every additional degree of temperature.

It is very important that the dates be carefully observed of all the symptoms connected with the disease, and experience has shown that memory is very untrustworthy; by all means, therefore, let all the above facts be clearly *written down* as soon as possible after the observation is made.

Shut all suspected cattle in a lot or building by themselves, so that no other cattle can have access to them or to their droppings.

Send word as soon as possible to the nearest assistant commissioner, of the suspected; if a telegraph is accessible send him word through its agency.

2d. Means of prevention.

When the disease is present in any neighborhood, every owner of cattle should be provided with a barrel of heavy coal oil, which contains from eight to twelve per cent. of carbolic acid, and a quart of liquid carbolic acid, which contains ninety per cent. of the acid; the latter is mixable with water, the former is not.

If the suspected cattle are kept in a building, let the floor be sprinkled with the heavy oil, and especially let it be sprinkled on their droppings as fast as they are made. The wood work of their stalls, and behind their stalls, should be covered with this substance, spread on by a common whitewash brush. The heavy oil may be sprinkled on the floor through a common watering pot. These articles are furnished by the Warren chemical manufacturing company, No. 4 Cedar street, New York.

If the suspected cattle be herded in a yard or small pasture, let the droppings be sprinkled daily with heavy coal oil.

Remember that strict isolation is the chief means of safety. Let no strange animal come upon the place. Let no suspected animal go on any public road nor have access to running water to which other animals go. The dung and urine of such animals are the chief means of propagating the contagion, and it is known that it is often diffused by the dung which adheres to the shoes of attendants. A box containing slacked lime or ground plaster well saturated with the heavy oil, should be kept near the diseased animals, and all persons, when leaving the vicinity of such animals, should carefully rub their shoes in the powder in the box.

3d. *Curative means.*—There is no certain cure for the disease yet discovered. Some animals get well without any medicine; others seem to have benefitted by feeding in a salt marsh and on green corn.

In case you have the liquid carbolic of ninety-five per cent, which will mix with water, drop enough of it into a pail of water to give a slight taste of it to the water, and let them drink of it twice a day.

If you have nothing but the heavy oil, mix three ounces of soda with it, which will make it mixable with water, and put the mixture into a quart of water, pour enough of this mixture into a pail of water, and let them have two pails full a day.

Let the sick animals drink freely of water, as they are generally very thirsty, and place salt where they can lick it whenever they are disposed to do so.

With regard to food, follow the advice of the medical practitioner.

If carbolic acid cannot be obtained, dissolve two pounds of sulphate of iron (green copperas) in a gallon of water, and use the solution as directed for the heavy oil.

Bury them in a grave at least seven feet deep, and cover the carcass with a barrel full of quick lime, ram two feet of earth well down over the lime, and then fill in the remainder of the earth.

In regard to the burial of dead animals, you will permit me to say that one of the prolific causes of the spread of this disease has been the careless burial of animals that have died of it. By all means, if you value your herds, bury the dead animals carefully, and if you can throw a barrel of lime over them, all the better.

Now, gentlemen, the question is: What shall be done with the Texas cattle? Shall we, by law, utterly prevent their coming here; inflicting heavy pains and penalties upon those who import them? Is there any peried of the year when they are not harmful, during which they may be permitted to come in, while we exclude them at other seasons?

With regard to all this, I am unable to say anything, because that is a matter in relation to which we have come here to be enlightened by you of the west. But one thing you must bear in mind, that is, this thing must not be tampered with. If it shall be proved that, by the introduction of Texas cattle, these broad and beautiful and fertile prairies are to be filled with these spores, that abound in the grasses of Texas, recollect that you are to give up cattle altogether; that you cannot raise them at all. You must settle that question definitely and honestly, looking it squarely in the face. If there is no time when Texas cattle can safely come in, then they must be excluded, painful as it is for me to say so, for cheap meat is what we want in New York, and, from what I hear, our only hope of obtaining it is by importation of Texas cattle. But if their introduction is going to kill off all your herds so that you cannot supply us with any meat at all because of your prairies being so thoroughly poisoned, then it is for our interest to exclude them altogether.

You must consider the power of this parasite to spread, and also the question of its acclimatization in the grasses of this western country, and the possibility that your prairies will become so infected by this poison, as to be utterly worthless for cattle purposes.

In conclusion, gentlemen, I have some hope, and in fact a very strong one, that the ravages of of the Texas fever may be somewhat circumscribed through the destruction of these spore by means of carbolic acid, and I am perfectly confident that they will be so circumscribed if you will but once begin the use of it. And then, again, it does not seem to me to be altogether hopeless that these spores may be destroyed, by means of carbolic acid administered internally, before they can be discharged upon your prairies.

Gentlemen, I apologize to you for trespassing so long upon your patience, and will close with this motion, that a committee be appointed whose duty it shall be to draft a series of propositions that may be enacted into laws by the legislatures of the several states interested in this matter.

Dr. Clendennin, of Ohio—Before the motion is put, Mr. President, I should like to suggest that that committee be composed of one member from each state and province represented in this convention.

The amendment was accepted, and the motion prevailed.

The President—The chair will consider it a favor if the delegation from each state will suggest one of its members to act upon this committee. I will appoint the gentleman from New York (Mr. Gould), chairman.

Mr. Chadbourne, of Wisconsin—I move that when we adjourn, it be till half-past seven o'clock this evening.

The motion prevailed.

The President—Before we adjourn, gentlemen, I would like to submit a communication received by the chair:

SPRINGFIELD, December 1, 1868.

To the President of the Stock Convention:

SIR—I have the honor to transmit herewith a copy of a resolution adopted by the Board of State House Commissioners, in compliance with their instructions.

Very respectfully, your obedient servant,

J. C. WEBBER.

Resolved, That the Stock Convention, now in session in this city, representing many of the States of the Union and Canada, be and is hereby respectfully invited to visit the grounds and examine the foundation walls of the new state house, now in process of erection in this city, stating a time most convenient to themselves.

The communication was received, the invitation accepted, Tuesday 12 M., fixed as the time, and the secretary directed to reply to the invitation accordingly.

Whereupon the convention adjourned, to meet again at 7:30 P. M.

EVENING SESSION.

THE PRESIDENT—Will the various delegations, as the roll is called, name the one of their number who shall serve on the committee for the purpose of drafting the law to be submitted to the several legislatures of the states and to the parliament of Canada.

The roll was called, with the following result: Ontario, Hon. D. Christie; Ohio, Dr. Wm. Clendennin; Maryland, Dr. Richard Mackall; New York, J. Stanton Gould; Rhode Island, Dr. E. M. Snow; Wisconsin, B. R. Hinckley; Michigan, Dr. M. Miles; Massachusetts, Dr. Thayer; Missouri, Dr. L. D. Morse; Indiana, James Poole; Illinois, Dr. Wm. Kile.

The committee was ordered to report in the shortest time consistent with the magnitude of the subject to be considered.

MR. CHRISTIE—Mr. President, as the subject matter before the convention was considered in but one aspect by the gentleman from New York, (Mr. Gould), I would now suggest that the medical aspect be now considered by Dr. Morris, of New York; for I think that the convention generally are very anxious to hear him, and to see the illustrations which will accompany his remarks.

DR. MORRIS, of New York—I am not exactly prepared now, Mr. President, to go on. I would ask to be excused until to-morrow.

THE PRESIDENT—We shall be glad to hear from the gentleman at his convenience.

PROF. CHADBOURNE, of Wisconsin—Mr. President, the paper presented to this convention by the gentleman from New York, (Mr. Gould) was, in my judgment, a very important paper—covering a great deal of ground. And as it, in itself, presented to us points that can be considered without any special reference to the medical views of the subject, and as the gentleman who presented that paper said that he should be glad to answer any questions, there are two or three things that I should like to ask him about at this time. The gentleman, as I understood, seemed to think it possible that the grasses upon our prairies might become so infected with these spores that it might be almost impossible to raise cattle here.

Now, that sir, is a very startling theory, and I wish to know if he, or any other gentleman, is in possession of facts that tend to substantiate any such proposition or theory. I have yet to learn that any cattle have been infected by this disease by feeding upon any pastures over which a winter has passed between the time of Texas cattle passing over them, and native cattle feeding upon them.

Now I wish to ask this question: Suppose that Texas cattle have gone over a pasture and left there the seeds of a disease. After winter has passed, is there any sort of danger that any other cattle coming into that pasture will be troubled with that disease?

On the other hand, has it not been proved by observation that a winter kills out, so far as the pastures are concerned, all seeds of the disease? If this be true, my own mind would be very much relieved, and I doubt not, of very many other persons who were startled by a theory which is certainly a very plausible one.

MR. GOULD, of New York—Would you like to have me answer that immediately.

MR. CHADBOURNE—If you please.

MR. GOULD—The interrogatory is a very proper one, Mr. President. I had in my mind what I supposed was an undoubted fact, but which has been to-day denied; and as I do not wish to give any unauthentic fact to the convention, it may perhaps be proper for me to relate one of the circumstances upon which my statement was based.

Mr. Harvey Sandusky states that a gentleman near Mattoon, Illinois, had, last fall, a number of Texas cattle pastured upon his land, and that, after these cattle had been taken away, he drove in some of his native cattle, a very large portion of which were destroyed. As a hurnt child dreads the fire, he was afraid to risk his cattle there in the spring. He, therefore, allowed the grass to grow up, and it did grow very luxuriantly. One of his neighbors who was short of pasture, desired to turn his cattle into that lot. The gentleman told him that he was afraid to turn his own cattle in; but the neighbor having no fears of that kind whatever—believing that a winter's frost was quite sufficient to destroy the virus which had been left there by the Texas cattle—did turn them into this pasture. The consequence was that twenty out of forty cattle which were turned in, took the Texas cattle fever and died this summer. That is the story as it was told to me.

Dr. Kile, of Illinois—Mr. President: I suppose that I know something about this case referred to by the gentleman of New York. The circumstances occurred at Mr. Diller Dole's, five miles northwest of Mattoon, and were these: A year since, Mr. Dole, who is a large land owner, rented a pasture to a gentleman who had a number of Texas cattle. These cattle remained there a month or two. Some gentleman purchased, say one hundred cows south of that point, and rented this pasture for them. I would say, by the way, that none of the Texas cattle had died. Mr. Dole rented it, and in August or September the cattle were turned in, and thirty-five out of seventy head died.

Mr. Christie, of Canada—Mr. President: In regard to Mr. Harvey Sandusky, I would say this, that I took occasion, with Mr. Stone, to come to Springfield, by way of Mr. Sandusky's, with him. He was asked, in the presence of other parties, in regard to this affair, and repeated the same story exactly as given by the gentleman from New York (Mr. Gould), and the parties present corroborated the statement. This statement was, that the cattle were brought to Mattoon a year ago this fall; were fed on this lot during the winter, and were sold in the spring. After they had been sold, this neighbor, seeing the grass come up very luxuriantly, was anxious to avail himself of so good feed.

The proprietor of the lands, whose name I do not know, stated that he thought it was unsafe to turn cattle in there, and he didn't use it himself on that account. However, the other person treated the matter lightly; put his cows in there, and had lost twenty out of forty. That was the statement to Mr. Stone and myself; and moreover I find the following statement in the "Report of Commissioners on the Texas Cattle Disease, to the Pork Packer's Association of Chicago, October, 1868," said to have been made to Captain Brown, one of the commissioners of the Illinois State Agricultural Society, by V. T. Chilton, of Smith City, Mo., on the 4th of October, 1868: "I have never heard of but one herd that was wintered here that was diseased the next summer, and they may have taken it from other droves that were passing through the country." So that there is one case in Missouri where this thing has happened. In the other the cattle were brought into the pasture in the fall; were fed during the winter, and were sold in the spring; the cows following them the next summer.

Mr. Chadbourne—That is not the point, Mr. President. Is there one single case known where cattle have been removed from a pasture, there being no cattle in that pasture during the winter, and where animals put in that same pasture during the following season have been infected?

Dr. Morse, of Missouri—It seems to me, Mr. President, it makes little difference whether the disease remains over winter in or about the cattle, or in the pastures.

Dr. Clendennin, of Ohio—It seems to me it makes a vast difference, Mr. President; for we can kill the cattle, but if the disease is in the grass, and continues there from year to year, we shall want a vast amount of carbolic acid to kill it out in these broad prairies ef ours.

Dr. Kile, of Illinois—I have lived, Mr. President, in the county adjoining Coles county, and, having been acquainted with the gentleman referred to, I can say he is as truthful and responsible a man as we have, but I know he has been very much excited regarding this disease. I heard this same report, and as Mr. Dole was referred to, I made it my business to inquire of him. He told me distinctly that the cattle were put in in the spring, and taken out some time in the mid-summer; that the pasture was afterward rented to this man, who was buying cows for the Chicago market, and who put them into that pasture—there being no winter intervening. I will further state that I made these inquiries for the purpose of being able to state to this convention, and being able to state te them the exact facts. Mr. Dole further remarked that this scourge had been little felt there; that they had not allowed any Texas cattle to be unloaded at that point, and had consequently escaped the disease. I know, however, that Mr. O'Hare, the ex-sheriff of Coles county, brought there, summered and fed, and took to market, over one hundred head, without any disease making its appearance. Mr. Van Daren, a few years ago, brought in three hundred head, which were grazed, fed, and sold to farmers, without our ever hearing of any disease.

So far as I know, the disease has never appeared in Coles county, except in this isolated case.

MR. POOLE, of Indiana—I would ask the gentleman, Mr. President, if, in driving these cattle to pasture, they might not have been driven along the roads or trails or feeding grounds where Texas cattle had been before them, and thus been exposed in other places besides this pasture.

DR. KILE—In reply to the gentleman, I would say, Mr. President, that most if not all of the cattle brought there came from Cairo direct. It is a section of the State where cattle are not driven from the south to the north. Mr. Dole told me that these cattle were bought in Marion county, which is almost due south from Coles.

MR. POOLE, of Indiana—Mr. President, it does not appear to me that a statement of this kind would be sufficient to establish anything positively; but I have a case in point where I know the facts myself. Mr. Earl, one of the commissioners from Indiana, is a very large dealer in cattle. He and his partner had a number of cattle brought direct from New Orleans by the river. They were re-shipped at Cairo, and brought to our town on the Wabash river, arriving in very bad condition. Having been brought up in steamboats, they were shipped to Attica, but were so crowded into the cars that they were trampled on, and some, to my personal knowledge, had to be pulled out of the cars, just alive, and so badly used up that they could not stand. Several died then, while others were about in that condition for some time, and, when put in a stable and attempted to be cared for, nearly all died.

These cattle were pastured up and down the river a distance of ten miles, and were herded until spring in different pastures; among which was one of my own.

THE PRESIDENT—What time did these cattle arrive, sir?

MR. POOLE—Some time about a year this coming January.

As I was about to remark, some of those cattle died in my field, and their bones lay there yet; and after they had cropped up that field, they were taken to other pastures up and down the river, nearly all of which they used up. To my knowledge, in not one of those fields—not a single one—has there ever been a case of Texas fever. In my own fields, I put in sixty head of fine fat cattle, when the disease was raging worst about our town—the result of unloading cattle there in July. Those sixty head of cattle were only half a mile distant from where the cattle were dying in town; not a single one was sick, or died, and I don't know of a single animal that died, up and down that river, in case of cattle situated as mine were. But, regarding the lot that was unloaded and passed through our town about the 2d of July, two-thirds of the stock in our town died, as the result, and so for all along this road, a distance of fifteen miles.

I do know that, as far as those cattle of Mr. Fowler's were concerned, not a single case of Texas fever has occurred there. This I know to be a fact.

DR. CLENDENNIN, of Ohio—Mr. President, as there does not seem to be anything particularly before the convention, I will give my experience in reference to the use of carbolic acid.

On the 3d of June, the last herd of Texas cattle were brought to Cincinnati over the Ohio and Cincinnati road, and were put into stock pens. They remained there over night only, and, on being inspected by our meat inspectors at that place, they were found to be very poor and covered with ticks. They were ordered to be taken out of the pen and out of the city, as they were unfit for food, simply because they were so poor. They were taken to Jones' Wood pasture, eight miles from the city, where they were kept two days, and then brought back to the city. In the meantime there was a drenching rain, and the cattle were pretty well washed. They were put into pens at the Brighton stock yards, where they remained perhaps twenty-four hours, when they were removed for the second time to Jones' Wood pasture, where they remained some three weeks and were fattened up.

On one occasion some of these animals were stampeded when going to water, and broke into the grounds and gardens of the village through which they passed. The animals with which they came in contact, or that were kept on the grounds over which they passed, took the disease and died. These facts I know, for I followed out ever single case myself.

These animals were finally spirited away, and killed, I presume, for the Cincinnati market; as they were outside the city limits, our inspectors claimed they had no control over them.

Within ten days after the herd was removed from Jones' Wood, 29 cows were put into the same pasture, where they remained, I think, about a month, when the owner observed that the animals were ailing and the symptoms described by the gentleman from New York (Mr. Gould) were precisely those presented by these animals; that is to say, the first manifestations were drooping of the head and ears, and that marked stare, which he so well described. In the early stages of the disease the animal sought the water, lying down in it, and plunging in the nose and face up to the eyes, holding the head in that position as long as was possible without taking breath. This was only during the early stages of the disease. During this time, the temperature of the body was increased, as proved by actual observations made by the thermometer. They would then leave the water, and within four days from the time of the attack every single one of them died. I examined twenty-four of those twenty-nine cows—every one of which died within ten days. I did not find any disease of the rectum, as Mr. Gould has described; that I found perfectly healthy. If there was any change, it was perhaps a little paler than natural. I found one symptom to which the gentlemen did not refer—(interlobular emphysema)—infiliation of air between the lobes of the lungs; that existed in every case, and in some cases was very marked.

There were two cows, that were particular favorites of one gentleman, who desired to save them. They were but slightly affected—and his own opinion was that they were not at all. He took them from the herd and put them in a lot near his house, in which were two pet cows, which had been kept entirely separate and apart from the Texas cattle, nor had they been brought in contact with his own diseased cattle until those two cows, on manifesting the first symptoms of the disease, were put into the lot with them. These two cows were put on the carbolic acid treatment, suggested by the commissioner from New York, (Mr. Gould) through the instance of the same gentleman who first proposed this treatment in this country. By the way, this remedy was used very extensively, as you are aware, in Great Britain, and in the north of Europe at the time of the prevalence of the cattle disease there. I refer to Dr. Haines, with whom I was in communication at that time. Carbolic acid was used externally, diluted, and internally, in combination with soda and glycerine. The life of those two cows was, perhaps, prolonged by this treatment, but they died within a week, although the fluids and food which they took contained carbolic acid in some form, diluted.

The two pet cows were also put upon carbolic acid water as a beverage; their hides were sponged over twice a day with a solution of it, and, yet sir, they died. On examining them I found the symptoms almost precisely as the gentleman has described here to-day. Now, there is one case of the use of carbolic acid in which the animal lived, perhaps, fourteen days or two weeks only, though taking carbolic acid from the first manifestation of the symtoms. I do not mention these cases to prevent gentlemen from using this remedy, for I believe it is one of the best remedies we have for many diseases, but I wish merely to direct the attention of gentlemen to the fact that it is not, perhaps, as reliable as some suppose.

The other case in which I used carbolic acid was in that of the cow kept by a gentleman for his own private use. The animal had every care and attention, and the acid was used thoroughly and persistently. During her sickness the gentleman required his dairy woman to milk the cow every day, to relieve the udder, and add to the comfort of the animal. The cow was a very good milker, but on the second or third day previous to her death, she yielded, perhaps a pint. The gentleman had two full grown Maltese cats, which he was in the habit of feeding himself, but being in a hurry in the morning, he directed the servant girl to feed the cats, (who always ate breakfast at the time he did) with milk. He did not intend that they should have the milk from the diseased cow, but the girl so understood it, and gave it, and those cats died on the third day subsequent. They were found, on careful examination, made by myself, to present all the symptoms of the cattle disease.

Gentlemen using carbolic acid should bear in mind that it is a very active agent. It will take the skin off the animals as well as in human beings, and it should be used with caution, and then only when largely diluted.

Dr. Miles, of Michigan—Allow me, sir, to ask a question. Was the temperature of these animals taken at the time the carbolic acid was administered?

Dr. Clendennin—Yes, sir.

Dr. Miles—What was it!

Dr. Clendennin—It a little exceeded 103.

Mr. Poole, of Indiana—Mr. President, as this seems to be rather a class-meeting, for the purpose of informing one another what we know, it may be well enough for me to state a theory prevalent among cattle men, in regard to this disease, and that is, that cattle must necessarily pass over a trail, road or pasture, over which Texas cattle have passed, and that otherwise they cannot take the disease, and that it cannot be taken across a fence. Now, sir, as I remarked, it was between four and six weeks after certain cattle passed through our town, before our cattle commenced dying. I quit my business, and until the disease entirely ceased, I saw nearly every case that died in Attica. This happened in one case: In a field, right opposite the depot where the cattle were unloaded, were a two-year old heifer and its mother; had been from early in the spring. They had never been out, never were out until the cow died, and I don't know but what the heifer is there yet. These cattle, as they were unloaded, passed right along close by the fence into the other part of the town, and so on east. This cow, which was a very fine one, weighing 1,200 or 1,400, took the disease. First, ticks were discovered upon her; in a short time she began to show symptoms of the fever; and some two or three days after its first manifestations, she died. The heifer all the while kept along by its mother's side, and was by her when sick, but was itself never sick, though it had these ticks.

This case proves conclusively to my mind that the Texas fever may be taken across a fence; that it may be taken without cattle passing over the same ground or trail, or eating from the same grass where Texas cattle have been. Now, from what my friend (Dr. Clendennin) stated, about the cats eating the milk and dying, it would look very much as if any thing using the milk would die. There is, in my town, a certain maiden lady, very well off, in personal goods, and who owned a cow. The cow was taken sick, and the morning, or the evening, I think it was, after being attacked, the lady discovered something unusual about the animal. The cow was milked and gave a small quantity—not as much as it was in the habit of giving, which was as usual strained and put into a crock. The next day the cow was found to be very badly off, and the day after, it died. The lady had some preserves that she took a fancy to eat, and without thinking anything about the cow being sick, she took the cream from this milk and ate it with her preserves. A day or two after that she was taken quite sick, and upon thinking about the cow dying, and her having eaten this cream with her preserves, she came to the conclusion that as likely as not she was going to die with the Spanish fever, and not having her affairs in exactly the state that they ought to be, she sent for me to make her will. I went to her and got directions as to how she wanted to dispose of her property; rather made sport of her that she was more scared than hurt, and that there was no danger of her dying, but she said that she didn't feel well, and had a congestive chill or something of that kind, and wanted to make a will. I made her will. The next day she was about, as well as ever, and has never been sick since. I am satisfied that the cream from the milk of that cow, had no effect whatever upon her.

Dr. Johns, of Illinois—I should like to ask the gentleman, Mr. President, if a post-mortem examination was made of that cow?

Mr. Poole—No, sir, but the cow exhibited exactly the same symptoms as the other cattle who died of the Texas fever, and the disease proved fatal in very nearly the same length of time and a little earlier than in some cases.

Prof. Chadbourne, of Wisconsin—I should like, Mr. President, to ask the gentleman, as his statement is a very important one, if these cattle passed along the side of the field in such a manner that there was no possibility of this cow coming in contact with them, or if the land was in such a position, that, as rain fell it would wash from their track into it?

Mr. Poole—The only way, Mr. President, that they could come in contact, was by one or the other pushing the nose through the fence. That of course might have happened, but I don't know whether it was the case or not.

So far as the ground was concerned, it was about as level as this floor, and I wouldn't say which way the water would go, but would rather think that it would run from the field.

I know, also, that instead of the water that the cattle in that field drank, running into it, that it ran out of it.

The President—As this tick matter has been mentioned, the chair would ask permission of the convention to make a little statement regarding it.

On my farm, which is composed of several hundred acres, and in the country thereabouts, when the land was first cleared up, until the stumps were worked out, wood ticks were very abundant in the spring of the year. And on one of my outlying pastures, consisting of 100 or 150 acres, where some trees grew and stumps yet remain, the horses and cattle, when turned out in the spring, are so infested with these ticks, that we are obliged to get the animals up every few days, rub them over with crude oil or something of that kind, and scrape off these pests. They sometimes become so troublesome as to cause sickness. They annoy the horses the most, but get on the cattle to some extent. After five or six weeks, when it becomes hot and dry, the ticks all leave.

I only speak of this as showing that it is barely possible that ticks can propagate this disease, for they are in the grass, and as the cattle and horses feed, they crawl off on their noses or upon their bodies when they rub against stumps. We then never considered them as dangerous, though they are very annoying, as they get fastened in the hair of the animal and suck its blood. But when I have heard the tick spoken of as being the cause of this disease, I am free to confess that I thought it was nonsense, because ticks abound all over western New York, Canada, and I don't know but here, though perhaps not in your prairie country. But I take it that on wooded land, there are plenty of them in the spring and early part of the summer.

Dr. Kile, of Illinois—I, for one, Mr. President, and I know that this is the case with very many members of this convention, would be pleased to hear from Mr. Eaton, Mr. Alexander's superintendent, who has certainly had as much experience as any one man regarding this disease.

The President—Mr. Eaton, will you be kind enough to come forward and let us hear from you?

Mr. Eaton—I am not a member of this convention, Mr. President, and as I did not expect to be called upon, I have not prepared any remarks whatever, but I will be very glad to give my experience and I will do so in as intelligible a way as I can. I have had more or less to do with this disease ever since it made its appearance in Illinois; and have gathered a few facts, part of which I have retained in my memory, and part of which I have committed on paper, that I might not forget them.

I might remark, before commencing with this year's experience, that last season we grazed upon the Broadland's farm, about 500 Texas cattle, a portion of which had been wintered in Missouri, and a portion on the farm. We grazed these last summer, mixing them promiscuously with 4000 native cattle in the different pastures, and there was no appearance of the disease last season—1867.

This season we commenced receiving Texas cattle on the 31st of May. The first lot came up the Mississippi river by way of Cairo; were unloaded from the Illinois Central road, at Tolono, and were driven to the farm. We continued to receive different lots, weekly and daily, almost, nearly two months. I observed when the cattle first began to arrive at Tolono, that they were covered with ticks—and I mention this now as the tick question has been alluded to by several gentlemen. The cattle were driven to pastures, and I then observed further, that about ten days after we put the cattle into the pastures the ticks disappeared entirely.

The President—How thickly covered with ticks were these animals, Mr. Eaton?

Mr. Eaton—I could not say, sir, just how many there were, sir, of course, but I think some had 10,000. In many places where the animals could not rub them off, as in the flanks and crotch, they were almost as thick as they could be.

The President—Did these ticks keep growing and falling off, Mr. Eaton?

Mr. Eaton—When they became gorged with blood, they fell off, sir.

The President—Not until then?

Mr. Eaton—Not until then; finally they all fell off, and I thought no more about them. But about the 25th of July, I discovered that small ticks, in countless numbers, were making their appearance through the pastures where the Texas cattle were grazing, particularly in the vicinity of their watering places, on posts against which they rubbed themselves, etc. I discovered myriads of them on the grass, all over the pastures, and in such large numbers and so generally distributed that it seemed to be impossible for the cattle to graze without eating millions of them. They were very minute, so small that you could hardly observe them with the naked eye, and in fact I could not see them plainly without the microscope. They seem to belong to the same class of insects as our native ticks, but differed in appearance; I supposed them to be a variety of the same species. Those little ticks made their appearance about the 25th of July, I think, being about two months after the first Texas cattle were brought there. In a day or two this disease made its appearance, and then both Texas and native cattle were again covered with these insects. When first discovered they were very small, but soon began to grow, and when gorged with blood, fell off as in the first instance—most of the cattle having a second or third crop. Attaching themselves to an animal, and hardly discernible to the eye, they would, in the course of two weeks, grow very large, drop off, and then, as I suppose, reproduce themselves.

The fact that the disease made its appearance simultaneously with the small ticks, led me to think that they might have some agency in causing it, but whether they did or not, I don't know. But, as corroborating my supposition, I would mention the fact that we had a hundred oxen that were exposed to almost every Texas animal that arrived on the place up to the 1st of July, when they were removed (merely accidentally, as I had no fear or thought of disease) to a fresh pasture where there were no Texas cattle and where none had been. These oxen remained in the fresh pasture about two weeks, when having occasion to use them on another part of the farm, I took twenty-eight, brought them to the house and worked them some time, grazing them at night, or when not working, on pastures that Texas cattle had crossed over. Every one of those twenty-eight oxen sickened, and most of them died within two weeks after I brought them out of the fresh pasture; while the seventy-two that remained have never shown any symptoms whatever of the disease—although treatment, as to food, water, work, etc., was the same in every respect (except the exposure to the Texas trail after July 1st,) as was that of the twenty-eight that sickened and died.

About the 1st of July, there occurred in my neighborhood, and under my own observation, three instances where portions of herds of native cattle, that had been grazed on Texas trails, were removed previous to that time to fresh pastures. Those escaped all sickness, while the remainder that continued to graze over this ground sickened and almost all of them died. I have several other cases similar to that, and I am convinced that if all the native cattle in our country exposed to the trail of Texas cattle had been removed therefrom, previous to the 1st of July, we should have had no Texas fever.

So far as the ticks are concerned, I believe those are the only actual cases that I have; but there is one similar, which I will relate. In Indiana, about two hundred Texas cattle, that I had something to do with, were put into a pasture where there were about a hundred natives, where they remained for about two weeks. At the end of that time about one-half were removed from that pasture to another, some twenty miles away—being driven over the herding grounds of the cattle grazing through that country, and put into another pasture with natives. The native cattle in the pasture where the Texas cattle first were, sickened and every one of them died; whilst the native cattle in the pasture to which the Texas cattle were transferred, remained healthy. That was Dr. Jones' case. The Texas cattle, when put into the first pasture, were covered with ticks, but by the time they were removed to the second pasture the ticks had entirely disappeared, so that those cattle, being at that time free from them, has no opportunity of catching the small ones, when hatched, as did the cattle which remained in the first pasture.

The President—Do you know, Mr. Eaton, that the cattle died of the Spanish fever?

Mr. Eaton—I know, sir, that is was the disease called the Spanish fever—precisely the same one that has been described here. It occurred to me, when listening to Mr. Gould's remarks, whether the spores that have been discovered in the cattle could not have had some connection with these small ticks, that I know the cattle were eating all the time. I am not scientific enough to know whether such a thing is possible, as that the ticks eaten by these cattle may have some connection with these spores.

Dr. Kile, of Illinois—Pardon me for interrupting you, Mr. Eaton, but I would like to inquire whether cattle driven from Texas are infected with these ticks, or those only which have been transported by way of the river.

Mr. Eaton—I will give the gentleman my experience, Mr. President. We had on that farm some cattle that came up the river from the south, and also some driven across the country to Abilene, and shipped by rail from there. As far as my observation goes, the Abilene cattle were entirely free from ticks; and I do not believe, myself, that any cattle coming into our county from Abilene have communicated this disease; for I have not any knowledge of such a case, and cannot hear of any from authentic sources. I do not say, at all, that this is because they were clear from ticks, but the fact is certain that they were, and I don't believe that they have communicated this disorder.

With regard to my experience of Texas cattle in former seasons, it is this; that there is no danger of the disease after the cattle have wintered here; and this is also the belief of those around us. I know that last summer several herds of Texas cattle grazed all about us that had been brought into that region of country the previous fall and wintered there. They imparted no disease, whatever.

I have also been lead to believe, from my experience, that there is no danger, whatever, of this scourge being communicated atfer severe frosts, and my experience this fall proves it; for what native cattle we have on the place now, have been mixed promiscuously with our Texas cattle since the first of October. I considered it rather a dangerous experiment to allow them to be in such close proximity at so early a date; but I was very anxious to make the experiment—whether it would then do to intermix them. I did do so, and they have been running with the Texas cattle since about the first of October, and we have had no symptoms, whatever, of the disorder in our place since then.

If there are any further questions that gentlemen wish to ask me, I shall be very happy to answer them.

Mr. Stockdale, of Ohio—How is it, Mr. Eaton, about sucking calves not dying when the mothers have the disease?

Mr. Eaton—There are cases of that kind; I have known such. My experience has been that a greater percentage of old than of young cattle are affected with the disease. I think that observation warrants me in saying that the percentage of deaths is greater in proportion to the age of the animals. Very few calves died through the country. They almost all escape, and so do perhaps fifty per cent. of the yearlings; twenty-five per cent. of the two year old, fifteen per cent. of the three year olds, and so on. As you advance in years, the percentage of deaths is much greater. That I found to be the case, not only on the farms I had charge of, but also in that entire section.

Mr. McCoy, of Kansas—Mr. President, I would like to ask the gentleman how many Texas cattle he had on his farm, and how many native?

Mr. Eaton—We had some forty-six hundred odd Texas cattle on the farm during the summer, and in the neighborhood of six hundred native from first to last, mixed together promiscuously, without any attempt at all to keep them separate.

I will say, by the way, that I have seen ticks on calves; and perhaps I may as well say that out of the hundreds of sick animals I have examined, I never saw one that did not have more or less ticks on it, though in many that I examined it was very difficult to find them. For instance, my neighbor, Mr. Sullivant, came to me one day, after I had been talking about this matter, and said I would have to give up the tick theory; and was so much in earnest about it that he said he would give me a dollar apiece for every tick that I would find in a cow of his just dying. So I went down to see, and took my microscope with me, and after some considerable search, I began to find the insects, and in such numbers that it would have taken all his Texas cattle to have paid me if he had lived up to his bargain. [Laughter.] I found myriads of them, though I could hardly discern them, with the naked eye, until I found their haunts.

Dr. Rauch, of Illinois,—Mr. Eaton, will you please to state whether it was a microscope, or simply a magnifying glass that you made use of?

Mr. Eaton—A magnifying glass, sir.

Mr. McMillan, of Ohio—One of your answers, Mr. Eaton, is calculated to leave the impression that no cattle have ticks except those transported by public conveyance.

Mr. Eaton—I never saw any ticks, sir, on those that came from Abilene, but I did not say there were not any. My supposition about that is that they were originally covered with ticks, but shed them on the way, and had no opportunity of getting a second crop as they passed along.

Mr. Christie, of Canada—Do you say, Mr. Eaton, that no cattle coming by way of Abilene communicated the disease?

Mr. Eaton—No case ever came within my personal knowledge, sir, I could not say that the Abilene cattle brought on the place communicated the disease, because in coming they passed a trail of southern cattle, and on that trail cattle died. I could not say that the Abilene cattle did or did not impart the disease, for it might have been them or it might have been the others, but my observations led me to think that the Abilene cattle did not, from the fact that I put them into a pasture where there were natives, who did not contract any disorder from them.

Dr. Kile, of Illinois—Will you be kind enough to tell us, sir, if you know, from what portion of Texas these cattle that came from the south were?

Mr. Eaton—I think the most of them were, perhaps, from what would be termed the lower Brazos river, from the southern tier of counties on that river, and a few from the "Musquit" country. That was the information given me by the man who brought them here.

Dr. Kile, of Illinois—Can you tell us, Mr. Eaton, from your experience, whether the Spanish fever has ever been communicated by stock brought from northern Texas?

Mr. Eaton—I do not feel competent to answer that point, because I have never known so much about the localities they are brought from.

Dr. Clendennin, of Ohio—Do you know of any case, Mr. Eaton, where the disease has been communicated from native cattle to native cattle?

Mr. Eaton—No, sir. If the tick theory holds good, however, I can see no reason why native cattle should not communicate the disease to native cattle, as well as Texas to native, if we only give time for the ticks to mature. If the ticks drop off on the grass they reproduce themselves, and if they get on any other native cattle they will certainly infect them.

Mr. Emery, of Illinois—It takes about ten days, does it not, Mr. Eaton, for the large ticks to produce the small ones?

Mr. Eaton—No; my experience is that it takes about two months. From six to eight weeks after the larger ones fall off, the little ticks make their appearance. In regard to the twenty-eight oxen that took the disease, death ensued, in the fatal cases, within two weeks, and in more cases ten days from the time they were exposed the second time to the Texas trail.

The President—Did they have any ticks?

Mr. Eaton—Yes, sir, those that died were full of them.

The President—Were those cattle opened, and if so did you find them to contain ticks?

Mr. Eaton—They were opened, sir, but we found no ticks inside.

The President—Were the paunches opened?

Mr. Eaton—Yes, sir, but we could not, with the naked eye, discover any in the intestines, nor could we with any magnifying glasses that we had. I would say that we nowhere found destruction of the tissues. No case that came under my observation had proceeded so far as that.

Dr. Rauch, of Illinois—Will Mr. Eaton please state why, in his opinion, sucking calves do not die when the dam is diseased?

Mr. Eaton—No sucking calves died on my hands at all. I had a number of cows die that had sucking calves, and I supposed that the calves would die, as we had no milk to give them. I had so much other business to attend to that I did not give them any special attention, and, very much to my surprise, they all lived. They all ought to have died, really, according to the general order of things, [laughter] and this was the case with almost all of my neighbors, who lost their cows and saved the calves.

Dr. Rauch, of Illinois—If Mr. Eaton will pardon me, I would at this time like to make a statement with regard to the use of the milk of cows suffering with the Texas fever.

Mr. Eaton—Certainly, sir.

Dr. Rauch, of Illinois—As the poisonous effects of the milk obtained from diseased cows has been alluded to, I would state that, so far as my observation went, no apparent injurious effects upon the health of individuals followed the use of it, having made special inquiry in regard to the same. In a great many instances that fell under my notice, especially among the poorer classes of inhabitants of the 5th ward of the city of Chicago, where a great many cows died, the milk was used almost to the time of death, and in some cases as long as it could be obtained from the cow, without any immediate bad results. This was the case where the animals were not seen by an officer of the board of health or myself before death, as instructions were always given to throw the milk away, lest injury might follow its use.

Mr. Eaton—Since the gentleman has touched upon that point, Mr. President, I will relate my experience in regard to that matter. When the disease first made its appearance, it usually attacked our milch cows, and it seemed to be more fatal among them than any other cattle. I continued to use the milk very freely as long as we got any, and did so without thinking there was any danger. I suppose if I had taken any thought, I would not have done so, but I did use it until the cows dried up, and that, too, without any bad effects at all.

Mr. Christie, of Canada—Mr. President, there is one point which I think especially worthy of notice. From what fell from the gentleman (Mr. Eaton), it may be inferred, so far as his experience goes, at all events, that cattle which came by way of Abilene did not contaminate others. Now, I will simply say, for the information of Mr. Eaton, and others who have heard his statements, that, in this very county, the Canadian commissioners in the month of August found this disease to have been imported by cattle brought by way of Abilene, and that, too, on the farm of Mr. McCoy, one of the proprietors of the stock yards at Abilene. We visited his farms in August, found several dead, saw three die, and held twelve post mortem examinations. One of those cases was certainly among the very worst that we saw during the whole of our tour.

I find in the report of the commissioners sent out by the Pork-packers' Association of Chicago, and to which I have already referred, the following statement:

"Our next point was at Abilene, where extensive arrangements for handling and shipping this class of stock had been made by J. G. McCoy & Co. These yards were completed and ready for use September 5, 1867, after which time, in that year, about 1,000 car loads of Texas cattle were received and shipped east from them. From all we could learn there was no disease communicated from any of the cattle received at that point to the native stock of the neighborhood. The disease not following these cattle, in a measure threw people off their guard, and with the early spring of the present year, active preparations were commenced by the drovers for a large business in this class of stock. The journey overland was made with more than usual expedition in many cases, to take advantage of an early market—the first shipments being made June 10th; and up to the time of our visit over 900 car loads had been shipped east. We found on our arrival at that point that the disease had recently broken out among the native stock, and scarcely an owner was found who had not lost more or less. Post mortem examinations showed the same we had found elsewhere." Then, following that, we find: "On passing over the Smoky Hills we came to a herd of cattle, where we found a Texas steer, which had died during the night previous, not yet cold. The animal was carefully examined, showing the same general appearances that had been seen elsewhere in the native stock. There was the absence of bloody urine. There is no doubt that the animal died of the same disease that has affected the native stock." Then, in commenting upon their experience, they say: "Thus we found on the borders of Kansas the disease developed in the Texas stock, which we failed to find in the whole of our trip previously, through Missouri, Illinois and Indiana."

I think these facts, as there stated upon experience, establish beyond all question this, that the disease is communicated quite as rapidly by cattle brought by way of Abilene, as by those brought by more southern routes, and from Cairo by the Illinois Central. This point I wished to refer to in order that there might be no misapprehension on that point, as seems to me to be very common, because if it can be shown that these cattle, brought from southern Texas and northern Texas, have the same power of imparting disease, then the precaution should extend to one route as well as to the other. In fact, the case which we witnessed to-day was that of a steer brought from Abilene; and although it was said to be a Texas steer, my impression is that it was not full-blooded. At all events, if it was brought from Texas at all, it was brought by way of Abilene.

Mr. Eaton—With permission of the convention, Mr. President, I would like to make one remark.

The President—Certainly, sir.

Mr. Eaton—I gathered from the remarks of Mr. Christie, that he understood me as saying that Abilene cattle communicated no disease.

Mr. Christie—No, sir; not at all.

Mr. Eaton—What I desired to say, Mr. President, was, that no case had come under my observation.

Mr. Earle, of Indiana—Mr. President, our firm in Indiana have been handling Texas cattle for the last two years. The first lot, some 300 head, we purchased in Chicago, about the 1st of October, 1867. We drove these through the country to our farm, sent our man back, and bought about the same number—350, I think.

Our young man then went to New Orleans, and there purchased three hundred, getting them up the 1st of January. We unloaded them at Attica. All except eighteen, that were badly bruised, and that we lost, we finally took to our farm along in February, and mixed them up during the winter and all the summer with our native cows; and when the spring opened they were all very healthy, and took on flesh. They were very fat, and a great many cattle men came from a distance to see them. I believe the stock men agreed that they were as fat a lot of cattle as were ever seen in the west.

This spring we purchased 2,000 cattle, to be delivered at our place in June; but part arrived there about July, the second thousand reaching us about the 20th. Those cattle have done very well, are very healthy, weigh over 1,100, and are taking on flesh. We have mixed them with our cows and oxen without any damage.

At the same time, early in the spring, we sent a young man to Texas, who bought 600, and shipped them up. At the same time we bought about two hundred and fifty at New Orleans, that came up nearly the same date. The first lot arrived from New Orleans about the 15th of May; the Texas cattle got through about the 1st of June. We kept them where there were some cows and oxen exposed, and they died—eleven head; and that was the extent of the loss on our place.

My experience accords with that of Mr. Eaton: that the Texas cattle were perfectly healthy; they did not affect our oxen or cows.

As to the ticks, there were but very few to be seen on the Abilene cattle. The southern cattle had great numbers of them. Some of the animals that came through from Texas were so infested with them in the flanks and between the hind legs, that you could not put a pin down without touching one of them. They looked almost as if they were on top of each other. Texas cattle did not seem to mind them, although they disturbed our native cattle very much. After four to six weeks had elapsed, we found our mules and horses covered with these little pests, and they became so very thick on their flanks, etc., that we were obliged to clean them off.

From the 2,000 head of cattle that were taken off at Danville, carried out to Lafayette and pastured there, no trouble whatever has resulted.

My impression is that there has been much less trouble with the Abilene cattle than the southern cattle. It may be that, in some way or other, their being driven through the country clears them of the disease.

Mr. Stockdale, of Ohio—I would like to ask, sir, if the cattle had any ticks in the spring?

Mr. Earle—No, sir, none at all.

Dr. Rauch, of Illinois—I would like to ask the gentleman if he knows from what counties in Texas his young man purchased those steers?

Mr. Earle—Well, sir, we got one little lot of sixty cattle at New Orleans. About 225 wintered there, and 60 head came in on a schooner from the gulf, which were put into this lot and brought up in the summer. Our young man said that he did it as an experiment, to see how the cattle would turn out; and they did very well.

Dr. Rauch, of Illinois—Am I to understand you, sir, that part of the cattle purchased in lower Texas were driven across the mouth of the Red river, and a part shipped to New Orleans?

Mr. Earle—Yes, sir, and were mixed on the farm afterwards. The first lot we bought in New Orleans were wintered in Louisiana, except this little lot of sixty.

Mr. McCoy, of Kansas—Mr. President, in regard to the matter whether or not cattle coming by the way of Abilene communicate the disease, I feel somewhat interested. In June, 1867, I started west to find a place somewhere beyond the settlements—to some point where the cattle of the southwest, particularly Texas cattle, might be driven unmolested. My idea was to establish a station from which a Texas man with Texas cattle might stand at least an even chance of getting them to market undisturbed—a common center, where the buyers, coming from all over the country, might meet them, and thus create a market, in case that free right was denied the first holders to bring through their own stock. I made this determination in June; having selected my location, sent out a competent man, and, about the 1st of July, returned myself. Even at that time, cattle had begun to gather about this center, and they continued to congregate from that time onward.

And, by the way, I will say here that I do not think the state of Texas is generally understood; but if you will only stop to think of it, you can but be impressed with the vastness of its area—being six times the size of this noble state—and its infinite stock-raising capabilities, producing, as it does, three and an eighth millions of cattle—one-eighth of all within the United States. So deeply were its people impressed with the importance of some such move as we then made, that, during our canvassing of the country, the invariable answer to the question, "what is your great want? what will contribute more than anything else to your well being as a state and as individuals?" the answer invariably returned was, "only give us some outlet; some opportunity of getting to market such portions as we may desire to bring of the innumerable herds that are now roaming over our vast prairies, and are comparatively worthless for want of an outlet." I will state here, gentlemen, that at the close of the war, cattle were almost worthless in that section, on account of their untold numbers; and that this was the fact you will see at a glance, when I state to you that from a herd of 5,000 we bought 300 of as choice cattle as I ever saw for six dollars apiece, or rather, I would say that the average cost was about four dollars and a half apiece; while, at the same time, if those very cattle could have been lifted up, transported through the air, and set down in the Chicago market, they would quickly have sold for seventy-five.

Having this knowledge of the situation of matters, I selected that point with which you are already familiar, as the one best adapted for a depot at which these vast herds might congregate, be sold, and placed *en route* for market. I did this in the latter part of June, as I have already stated, and by the middle of August thirty-five thousand cattle had gathered around that common centre, mingling freely with the native cattle all through the summer. On the 5th of September we opened those yards and began shipping.

And right here I wish to say this regarding the Texas cattle plague: that notwithstanding there was this vast congregation of Texas cattle, mixed up promiscuously with the native cattle, not a single case of that disease occurred—not one.

A word in regard to the routes by which these Texas cattle in former times reached a market. They were sometimes shipped around to New Orleans, and then came forward upon the Mississippi, but most of them were driven directly to the mouth of the Red river, and I beg leave to call your attention to the character of the country through which they in that case passed. They were all the way exposed to a broiling, almost a tropical sun, through a region covered, in a great measure, with the pitch-pine, from which the resinous substances fairly boiled under the influence of this intense heat; through a country covered with an almost worthless grass, so utterly miserable that no steer in good flesh would eat it at all, and which a poor steer would only browse, rather than starve. Such was the character of a great portion of the country over which these cattle were obliged to pass.

At the river there is a vast swamp—or rather a great timber country, interspersed with innumerable swamps—where the cattle could not be kept waiting, and where it was absolutely necessary to push them forward by the first boat, at whatever price might be asked, when, of course, the motto of the steamboats was, the more cattle, the more dollars. Consequently, of course, the steamers were so much crowded that it would be impossible for a single animal to lie down during the whole trip, and so that there was no such thing as giving food or water to one of them, in a proper manner. I obtained part of these data of a gentleman entirely familiar with this subject, who assured me that on account of the way in which these boats were so densely packed, the cattle could not by any possibility change their position, but were obliged to stand from six to eight long days—the only way in which food could be given them being to throw it over them and let one eat it from the back of another—the only water that they got being such as could be thrown over them by the hose.

It is not to be wondered at, that after being subjected to such treatment as this, they should be diseased on arriving at Cairo, and be capable of imparting disease to the devil himself, almost, I was going to say. I do not hesitate to say that any cattle in this country, I don't care how healthy, after being treated in this manner, would become diseased beyond the possibility of recovery.

Respecting cattle that are driven from the west, our invariable experience has been, that when cattle have been wisely selected, driven rightly, handled as they should be, making daily only the proper number of miles, and stopping when they ought, and properly cared for as to food and drink, they have invariably arrived in good condition, healthy, sleek, and, as a rule, there was no disease. I do not pretend to say, that no cattle that came from that way, imparted the disease.

It is a fact, that when those thirty-five or forty thousand cattle were at our station in July and August—when there was so severe a drouth through the country that corn turned brown, as after a frost, and when all of our water was well nigh dried up—when it was very hard, indeed, to get proper feed and still harder to provide drink—some of them died; but I assert it as a fact, and I believe that gentlemen will verify my statement when I say, that when the disease did appear in cattle coming that way, it was in a mild form, and in many cases not fatal.

As to the causes of the Texas fever, I have long been of the opinion, and that opinion based on thought, reason, observation and inquiry, that it can be traced largely to the barbarous manner in which these Texas cattle have been handled; that in and of themselves, they contained no disease, for in their native state, they are as healthy as cattle anywhere. In Texas, and also in the country about Abilene, the drovers, a venturesome, wild, risky class of men, collect about them a set of younger men, as much wilder than they are as they are wilder than common men, whom they would send out to gather and drive in, and start to market, their cattle. On inquiring of them as to how they got along in collecting them, a common answer would be, "oh, we give them hell!" "What kind of drive do you make?" and they will tell you ninety miles in two days.

I tell you, gentlemen, that these cattle are, of all cattle in the world, the most tenacious of life, or the last one would be killed before getting here. Native cattle would not bear half the abuse—it would kill them stone dead.

I call upon every one who has had an opportunity of examining diseased cattle through Illinois, to testify if the larger part that have died in Illinois have not been lost on the line of the Illinois Central. And, as to the disease being almost certainly fatal, I was about to assert that scarce two hundred cattle have died in Illinois as the result of bringing animals from the west. I don't know as I would be quite warranted in making that statement, but I have watched the matter closely, and I do know this to be true: that wherever a man has brought through a drove that has been carefully selected, well driven and cared for, that herd will tell its own story upon arrival; and that, when you find cattle looking poor, rough, running off when you walk towards them, and with that peculiar air of wildness about them, you may be assured, beyond all possibility of mistake, that they have been promiscuously collected, badly handled and rushed forward to market by a man who esteems the best hand to be the one who will drive them the longest and whip them the most in a day.

As soon as the weather turned cold the cattle stopped dying.

THE PRESIDENT—Allow me to interrupt you, sir, to inquire if both heifers and cows are driven up, habitually?

MR. MCCOY—Yes, sir, they drive everything, from a sucking calf to a fifteen year old steer.

THE PRESIDENT—What do they do with the female cattle?

MR. MCCOY—I suppose you have been eating some of them in this town.

THE PRESIDENT—I asked, because I have never seen one of them.

MR. MCCOY—I was going on to say that the cattle, when they arrive in May and June, are not fat enough to go to market. During this last spring especially, it has been the case, that a large per centage of four-year-olds or older, have been bought by Indiana men, and sent forward here for pasture. And I will say, by the way, that they were bought instead of higher priced cattle, for the purpose of making money on them, and I leave it to every one who has handled them, if money has not been made—I say that it has, and largely, too.

THE PRESIDENT—I don't exactly yet understand, Mr. McCoy, what becomes of the cows.

MR. MCCOY—I was about to say, sir, that they were held there until they got fat enough for beef and then they were shipped to market, many of them being bought by residents of Kansas, Nebraska, Montana, Colorado, Idaho, and some going to California, even.

And in that connection I will say, that there are very few in Texas who spay their heifers, but they are very few indeed, for it is a little too much work for the southwestern man. Their cattle are so comparatively worthless for want of a market and an outlet, and so many difficulties have been thrown in their way, that the raising of cattle in Texas has been very much discouraged thereby. The dealers are so indifferent that I never yet have seen a man in Abilene who could tell, within five hundred, how many cattle he had, while I have often seen men who didn't know within ten thousand—there are so many of them and they are so nearly worthless that no particular reckoning is kept of them. Cattle are recognized by the brand. The laws of Texas require cattle to be branded when a year old (and not until then, as I understand it), and if those cattle are found one mile or a thousand miles away, the man whose brand they bear is considered authorized to take them; while on the prairie, cattle seemed to have no value at all, but to acquire it the moment that they arrive at our station; and it was a case of almost daily occurrence for a man, seeing fifteen or twenty of his cattle in another's herd, to "go for them," drive them out and take them off.

Mr. Christie, of Canada—Mr. President, I do not wish the gentleman from Kansas (Mr. McCoy), to suppose that anybody was speaking of him or his establishment with the least intention of saying anything derogatory. I am quite aware of the great exertions made by himself and his partners, which are very deserving of praise—they are so—I feel that. Besides that, I am quite willing to admit what I think is beyond contradiction, that the cattle arriving by way of Abilene, are in much better condition and are treated much better than cattle coming by the river.

I will not have him labor under the impression that I intended any reference to himself personally, or to his cattle. I spoke in order to counteract the impression that I feared might be left on the minds of some, at least, to wit: that cattle coming from the south alone, were those which contaminated others.

Mr. Rauch, of Illinois—I move, Mr. President, that this convention do now adjourn to ten o'clock to-morrow morning, Wednesday December 2d.

The motion prevailed.

SECOND DAY—MORNING SESSION.

The convention met pursuant to adjournment.

The President—If any gentlemen have arrived since yesterday who have not reported themselves, as delegates, we shall be glad to have them forward their names to the secretary, and to affiliate with them.

Mr. Hamilton, of Pennsylvania—Mr. President, I am directed by the Pennsylvania delegation to present the credentials of the following representatives from that state:

E. C. Hume, A. Boyd Hamilton, Dr. Hiram Corson.

Dr. Johns. of Illinois—Mr. President, I beg leave to lay on the secretary's desk the credentials of Dr. N. S. Townsend, of Iowa.

Mr. Reynolds, of Illinois—I move, Mr. President, that the gentlemen just named be admitted as members of this convention, without going through the formality of having their credentials passed upon.

The motion prevailed.

Mr. Smith, of Missouri—Mr. President, I believe I have some information on the subject of the Texas cattle fever, upon points not yet presented to the convention; but before presenting them I would like to say a few words relative to some matters that have already come before the convention.

1st. In regard to the enterprise at Abilene, it deserves high approbation. When considered simply as a financial speculation, I do not think that the go-aheadativeness and sagacity which conceived and carried it forward, can be too highly estimated; but when the gentleman asks our sympathy for men who have grown rich by doing nothing themselves but just lying back and allowing their herds to accumulate, I think it is very much like appealing to our feelings in behalf of the capitalists of Wall street, who, in the financial turn of the country, find themselves overburdened with greenbacks. If those capitalists chose to send out their money into the country to provide us with means wherewith to work, they certainly would be deserving of great credit; but it, with those greenbacks, they sent out a sentence of death to us, or imposed conditions which would in the end ruin every man who took them, it does not seem to me that they would merit anything at all. This illustration, as I conceive, applies exactly to this Abilene enterprise. It is not disputed that these Texas cattle, when driven through the country, will impart disease, and I have no doubt that if we should take two men, one of whom brings cattle to us by way of the Mississippi, and the other by way of Abilene, they would mutually condemn each other. I do not think, myself, that simply because Texas cattle reach us through the one or the other of those channels, they should therefore be allowed to, at all times, come into this country. Besides that, so far as one or the other of these routes being the principal one, more cattle have probably passed through the western counties of Missouri and the eastern counties of Kansas, than through any other sections—and what renders the matter worse there is that the driving is not confined to any particular tracts; and notwithstanding they are brought through in a more humane manner than through any other channel, they disseminate the disease more widely than any other herds. The cattle started from the Indian Nation and driven up through these counties, feeding on the rich grasses that grow so luxuriantly there, have nevertheless spread this pest so extensively through the country, that the people are desperate and are determined that no more cattle shall find a market by passing through that section of the country.

It seems to me that all these theories concerning the disease are premature, and when a committee was proposed who should report regarding the propagation of this disease, etc., I could not think of any time less than three years, in which they could possibly do so. A few such facts as were brought before us yesterday by the gentleman from New York (Mr. Gould), are worth all the theories entertained by the largest cattle growers that ever existed in the United States.

So much has been said and written upon this subject, that it would seem as if little which was new could be offered; but so long as there is a doubt and discussion upon the matter, we cannot dispense with any facts which may throw light upon it.

Theories can only be constructed upon a foundation of facts, and until we have more of these it is hardly safe to undertake to build up the latter. It is even denied by some that there is any cause for action; that Texas fever is a mere chimera, begotten in jealousy, and hatched in the interest of farmers and cattle dealers of the border states, who wish to stop the trade in Texas cattle, in order to remove competition in business. I know that such was the feeling among many, and I confess to a participation in it before I went to live in the district which has suffered most by the disease; but the experience of last summer ought to convince the most skeptical that it is a reality, and that the damages it inflicts are worthy of national consideration.

So long as these damages were confined to the remote borders of Missouri and Kansas, very little sympathy was elicited, and it was with some difficulty that the legislatures of the States most interested could be induced to pass laws upon the subject; and even when they did, they were so imperfect that the evil was only partially remedied. But the experience of last summer was too severe, and the lesson it taught too plain to be longer neglected.

I have here the report of Dr. Badger, published in the Missouri Agricultural Report of 1866. Before proceeding to read it, however, I would like to say that Dr. Badger has lived in Vernon county for a great many years; that he is an intelligent man, and one every way competent to observe and explain himself understandingly. And I felt, too, as if I ought to say this in relation to him, because very many things are observed by men, who, however competent in other places, are, like myself, not competent to investigate the pathology of the disease.

Before, however, quoting his remarks, I will read that portion of the report immediately preceding them.

"TEXAS FEVER AMONG CATTLE.

"Another pest which has made its appearance in the state within the past season is the 'Texas fever,' 'Spanish fever,' or 'Texas murrain,' as it is variously known. This is not a new pest in the state, as the statutes show. There was, however, almost an entire immunity from the disease during the war, when the driving in of Texas cattle was entirely suspended, with the exception, perhaps, of a very few isolated cases, which gave rise to the only cases occurring during the war.

"The subject is an interesting one, and one which will demand legislation. The existing law in the case seems to be entirely inadaquate for the protection, and the people have frequently been obliged to resort to other means.

"Mr. William Montgomery, of Stockton, Missouri, writes: We are at a loss as to how the disease is communicated, as there is no apparent disease among the Texas cattle; but wherever they are herding any length of time, our cattle take some disease peculiar to dry murrain, and the actions of the animal, with the disease, are similar to a horse with the botts or colic. They seem to suffer severely with inward fever. When dissected, they appear to be dry and scorched with inward fever Nearly all that take the disease die, unless treated immediately. Our remedy is, to drench them with lard, or slugs of fat bacon. It does not look reasonable that the Texas cattle could communicate the disease themselves; but the general opinion is that the disease is communicated by the breath.

"As to an amendment of the laws, we think it would be well to have them so amended as to prohibit Texas cattle from passing through the State, except during the cool season of the year, as we have noticed no disease similar to Texas or Spanish fever, except during warm weather—mostly contracted near ranches and watering places."

Another gentleman of Southwest Missouri, writes as follows: "I have lost very heavily this season by the 'Texas fever,' and although it is very strange to me how an animal that is healthy itself can impart so dangerous a disease to other healthy cattle, I am nevertheless satisfied that it can be done, as I have lost about one hundred and fifty head by the disease. They show the first symptoms by standing perfectly still in the position that they take to hold back, head down, fore feet thrust a little forward, ears dropped down, and are neither hungry nor thirsty. Their bowels become very costive; in fact it seems as if their intestines became entirely dry, and unless an operation can be obtained, they die. Our most successful mode of treatment was to make them swallow a piece of fat meat (bacon), and force another one up their posterior (rectum) with the arm, as large as admissable, and as far as possible. We saved about sixty after we adopted this mode of treatment, but the hair came off in spots from one to five inches in diameter. I doubt whether it can be cured in every case. I have heard a great many theories about it; but I understand you want facts and I have written them.

"There is another fact that cannot be gainsaid, that is, since 1861 there has not been a single case of Texas fever in Southwest Missouri, neither has there been any Texas cattle. Until the past spring and summer we have had Texas cattle and Texas fever. I have been dealing in cattle all the time since 1861, and in the time did not lose a brute until the past summer; so I say it is the southern cattle, and they ought not to be allowed to enter the State from the 15th of April to the 1st of October. Kansas learned this, and has legislated accordingly."

Mr. Huron Burt, of Williamsburg, Callaway county, says: "We have had some experience with the disease on the Nine-mile prairie. Last spring, early in April, a lot of oxen passed through our county on their way west, for some overland freighters, that had been shipped from New Orleans to St. Louis. The grass was just starting forth, and the cattle were occasionally stopped to bite at it. Wherever they grazed the virus of the disease was left, and all cattle that fed on the same ground on which the Texas oxen grazed, were afflicted with the disease—nine-tenths of all the cattle affected, dying.

"The disease was communicated for several months, in fact, during the whole season, until the unusually heavy rains in September, which seemed to have washed away the seeds of the disease that had been so fatally implanted all along their route. It was necessary for an animal to feed on the self-same ground to contract the disease. Those feeding up to the very verge of the poisoned ground, with only a fence intervening, were unharmed. And I am further informed that the disease is only communicable from Texas cattle. Stock, feeding after our home cattle that are diseased, escape unaffected.

"This has proven to be the most fatal cattle disease, and the most destructive to the stock growing interests, ever known in Callaway. Captain Hobson lost all his cattle, some fifteen or twenty, save one. His son lost all of his. Mr. Everhart lost several; among the number, a very fine bull, which is a loss indeed—animals of this character being quite scarce in our section. Mr. Joseph Grant lost some valuable cattle, besides others that do not occur to me at this moment. If the intervention of law was ever required in any case, for the protection of stock growers, it is in this instance; and I am heartily glad to see the movements made in this direction. Four and a half or five months should be the extreme limit allowed for passing this kind of stock through our State, and I am not sure but a shorter limit would be justifiable, say from November 15th to March 15th."

The following communication from Dr. Albert Badger, of Vernon county Mo., gives the most full account of the disease that we have been able to obtain:

THE SPANISH, OR TEXAS FEVER.

"The Spanish or Texas fever is well known to the older residents of this county.

"This disease was first recognized as having been propagated by cattle driven from Texas some twelve or thirteen years ago; the disease having been in the county some two seasons previous to its having been traced to the Texas cattle.

"From the first breaking out of this fever, it was found to be confined to the large roads or highways running through the county from south to north, and finally was centered on the Texas cattle, I believe, in the year 1853, by its being confined to one highway through the country, over which these cattle passed in that year. On this road the disease was quite fatal, killing about fifty per cent. of all the cattle on the road; the persons living near the water courses over which the road crossed, lost as high as ninety per cent. Captain Freeman Barrows, and Peter Colley, the one living at the ford of the Osage river, the other near by, lost the latter per cent.; one of them owning about one hundred head, while the former had considerably above that number. Mr. Collins, living at the ford of Clear Creek, south of the above, lost an equal proportion.

"The disease being in no other part of the county that year, satisfied the people, on this road at least, that they had found the true origin, as it had been among the cattle in the county for two summers past, In a season or two after, almost every settler of the county was convinced that the Texas cattle, in some way, communicated this fever to our stock, although a few persons living secluded from the great highways were unbelievers, and still remain so. In fact, the way this disease is propagated, the obscurity surrounding it for want of a defined cause, together with the different conflicting opinions of almost every citizen familiar with it, gives them, at least, a reasonable excuse for believing no one's opinion. Two things only—the symptoms of the fever and its fatality—are agreed to by every one; the latter being much greater in a warm, dry summer than in a cold, wet one; the disease always ceasing when the frosts and freezes have killed the vegetation.

"The first symptoms of the fever discoverable, several days before there is any appearance of the sickness, is a dry cough, which is noticeable by careful observers. In a few days after this, the nose becomes dry, and the ears slightly drooping, when more flies will be found to collect on this than the other cattle. At this stage the breath will be found to have lost its sweetness, so peculiar to grazing cattle, and assumed the sickening, feverish smell, generally, if not always, found in Texas cattle, which I can best describe by comparing it to the smell of our slaughter houses, or constantly crowded stock yards in cities. From this condition, in one or two days the fever gains its highest stage, and is found to have disseminated itself over the whole body, the heat being very great, and the arteries of the neck are seen to beat in short, heavy throbs, and the ears very much lopped; the hinder parts reel in walking, the animal getting up or lying down with difficulty; the breath and exhalations are very disagreeable; the end of the tail is usually hollow for two or three inches; the pith in the horns has commenced to decay, if not already decayed; the animal refusing to notice the herd, remaining stupid, if not disturbed, neither seeking food nor water. Some, in this stage, will pass water mixed with blood, and dung naturally; others will pass water of a natural color, and not dung at all, or but very little, and that in a dryish lump. In another type of the disease, which will occur perhaps in every eighth or tenth case, after being taken the same way, and having the same symptoms as those described; even to the hollow horns and tails—the animal does not get weak, sluggish or stupid, but is always to be found on its feet, in a watchful attitude, with head turning to any noise, which, if close by, it rushes toward, even through fences or against trees; the eyes being of a green cast, very glaring and wild; those of the first type have a dead, sleepy and glazed appearance. Both these classes die, as I have described them, without any change, except their hair deadens before death, and has the appearance of that on a dry hide.

"The drove mentioned as having passed through the country in 1853, was owned by Mr. Richard Burriss, of Spring river. They were driven from Texas the fall previous, and wintered about fifty miles south of here, near Sarcoxie. In the first days of June, Mr. Burriss came into this county with his cattle, apparently healthy, in good order, and no lame ones in the drove—numbering about 450 head. He made a slow passage through the county, grazing in the best grasses near the road, unmolested, as no one knew at this time that this species of cattle propagated a disease to ours. In the first days of July the fever broke out on the road traveled by this drove, lasting until the frost put a stop to it, with the fatality previously mentioned. As the disease, this year, was in no other locality, except where these cattle were driven and grazed, the citizens, after carefully tracing their route through the county in all their wanderings, came to the conclusion, for the first time, that this fever was engendered from the Texas cattle. This was verified most fully in the next year; and up to the outbreak of the war, hundreds of circumstances have occurred in proof that they were not mistaken.

"No Texas cattle, until this year, have been passed into or through this county since the year 1860, except two yoke of oxen in the fall of 1865, worked here by Mrs. Box; neither has there been a single case of fever during this period, or any fatality among our cattle. Mrs. Box's were, so far as could be seen, healthy and not lame. The neighbor's whose cattle came in contact with these oxen were Mrs. Smalley, Mr. Cothran and Mr. Packard, each having the Spanish fever among their stock, losing some, notwithstanding the lateness of the season.

"About three thousand head of Texas cattle passed through this county in the month of June of this year, and a portion of them reached six or eight miles into the adjoining county of Bates, before being turned back by the citizens of that county. They returned on the same road previously traveled, making no delay in their passage either way more than was necessary. The disease did not break out for some six weeks or two months after the passage of the droves, many more recovering from it than usual—and about forty per cent. dying—extending into Bates county to the point where they were turned back. It proved more fatal in the crossing of water courses, killing about seventy per cent.

In 1858, my stock were exposed to this fever by coming in contact with a drove of Texas cattle. The fever was very bad among them, one or two dying every day through the month of August; they were in daily contact with Mr. Millender's stock, who kept a herder, not suffering them to reach the grounds that had been used by the Texas droves, yet he had not a single case of fever. When spoken to about keeping my stock from coming in contact with his, he told me there was no danger of our own cattle diseasing one another. I have since watched many such exposures, and in no case has the fever been propagated. The farmers have each an opinion as to how the disease was propagated to their cattle, some thinking it is through the lame ones, a few of which will be found in nearly every drove coming from Texas. Their feet become worn out and sore from long travel, matter forms between the hoofs and is left on the ground and in the water through which they pass, and it is contended this inoculates our cattle by being taken into the stomach or otherwise. Others think it is done by the excrements left by those that are lame, or the diseased ones; while some think it is through the slobber or froth which is left on the grass. On one thing they agree—that the fever is propagated in some way, raging until the cold weather puts a stop to it, no remedy appearing to have any effect. From the few cases mentioned, which are selected from many of like nature, I have been led to believe, first, that the disease is conveyed to our cattle by those from Texas; second, that the feeding of a large herd one winter in this climate does not stop the spread of the infection from them in the next season; third, that Texas cattle, in apparent good health, give disease to ours; fourth, that the disease is not contagious from our own cattle to each other; fifth, that killing frosts will stop the disease; sixth, that no remedy has been found to cure this fever.

"In a very close observation of this disease among my own and neighbors' stock for the last thirteen years, I have generally found, on opening those that had died, but very little blood, and the following results: those that passed water mixed with blood, the kidneys and surrounding parts were entirely decayed, the other parts of the body sound; those that did not dung at all or but very little, with manifolds perfectly dry and partly decayed, while the large stomach would be more or less mortified—other parts healthy; those that appeared to dung and pass water naturally with a liver more or less decayed, the gall always swelled to its greatest tension—other parts healthy; those that were ever on their feet in a watchful attitude, the brain was found more or less decayed. This leads me to believe the disease to be in the blood, which finally becomes congestive, destroying the parts in a few hours after it becomes seated, and no doubt in many cases could be cured if we knew exactly when and where it had located itself—blood letting not being sufficient, of itself, to check the inflammation. The hollow horn and tail, no doubt, is caused by the fever destroying the blood in the extremities before it does in the vessels, which it does, in a great measure, before death.

"This county has suffered very severely with this disease for a number of years, losing in the year 1858, cattle estimated to the value of over one hundred thousand dollars. The present law is very defective for keeping out the disease. First, it only precludes the sick ones from a passage through the country, and few men, under oath, can say that, because a steer has an unhealthy smell, that he is sick, when apparently he is in as good health as their own cattle. Secondly, in order to separate the lame or sick ones, if any, the drovers, under our present law, are required to impound them, in order that the selection may be made. How is it possible to impound from ten to seventy thousand head of cattle when the owner has not a single pound, and no means of getting one? If a farm was bought for this purpose, the country for miles around would be overrun and eat out by these cattle waiting their turns for examination, thereby destroying every head of stock in that and the immediate locality; in fact, why select the sick ones when there is equal danger in those that are apparently well?

"One thing is certain, this part of Missouri, one of the best counties in the State for raising stock, must quit the business, or our laws must protect us. This can be done by so changing them as to preclude this species of stock entirely, or let this State buy a right of way from some point on the railroad to the northern border of Arkansas or the Indian territory, running as much as possible through our prairies. This will not interfere with citizens. Tax each head of stock driven over this road, one or two dollars until the road is paid for; the drovers will readily pay this sum, which, no doubt, will pay for it in two or three years. I was informed this year that there was seventy thousand head of these cattle between this county and Neosho, a distance of not more than one hundred miles, and that many more would be driven next year, if they succeeded in getting through this. By this means, a great outlet would be furnished Texas for the surplus stock, and St. Louis would also be the gainer. This would seem to be better than a law excluding them; and, further, this great highway, honestly conducted, would in a short time be a great source of revenue to the State. The drovers, this winter, on the meeting of the legislature, will spare neither time nor money to abolish the present laws, or getting relief in some other way. I propose for their consideration this road—without it they must give up their occupations or we must ours.

"Respectfully,
ALBERT BADGER.

"NEVADA CITY, VERNON CO., MO."

The report goes on to say:

"Reports have reached us of the ravages of Texas fever from Kansas, Tennessee, Kentucky and Illinois. The losses from it have been heavy; in some instances very choice and valuable stock has been lost.

"Western States have been severely censured in some quarters for passing laws to prevent the introduction of this disease, attributing to us selfish motives, namely, the prevention of the competition of southern cattle in our markets. It will be seen, by reference to the opinions already given of farmers of southwest Missouri, a locality that has suffered, probably, more than any other, that no such selfish motive is apparent. They propose that the Texas cattle shall be prevented from being driven into the state during the warm season when the fever is so readily communicated, but to be allowed unrestricted passage during the cold weather, when the disease seems not be readily communicated. Dr. Badger proposes that the State shall purchase a right of way from the southern line of the State to the Pacific railroad, on which Texas cattle may be driven at all times.

As before remarked, the subject has become one of urgent importance, and the legislature will be called upon to enact laws in the premises which will protect the interest of the State and the welfare of its inhabitants. A law entirely prohibitory, we think will be the only effectual method of keeping the disease out of the State. If southern cattle are allowed to be driven into or through the State at all it will be almost impossible to prevent more or less of our stock from the pestilence which they carry. Again, we think they should be kept out of our markets as a wise sanitary measure. It can scarcely be possible, certainly is not probable, that cattle carrying an infection of so virulent a character can constitute wholesome human food. Who would, knowingly, eat the beef of cattle with such a pestiferous breath as these Texas cattle seem to have? It can be no favor to the consumers of beef to have that article cheapened in the market by the introduction of an article of such very doubtful, not to say injurious character. We should keep out the Texas cattle on the same principle that we would the small pox or the cholera. They are pestilential. Who could complain or who would suffer from such a law? Chiefly, it would be the drovers and speculators in this stock who care more for filling their own pockets than for the losses of others, or the health of the community.

Commissioners have been appointed, and a good deal of individual effort expended upon the subject; but in most cases, the inquiry has been in regard to the pathology of the disease, rather than the best means of its prevention. To show that legislative action is necessary, and that it should be uniform in all the border States, I have endeavored to obtain information from those most interested, viz: the farmers along the borders. In this I have been only partially successful; but as I know that the answers to my inquiries are all to the same effect, and would be if I should extend them ever so widely, I offer these I have as a sample of what might be expected by the most extensive correspondence:

MOUNT VERNON, Mo., November 12, 1868.

PROF. SPENCER SMITH.

Dear Sir:—Yours of the 5th instant, came duly to hand; but, for the reason that I was very busy in court, I postponed writing until now. I have been living for thirteen years, or for the greater portion of that time, near the great thoroughfare for driving southern cattle to St. Louis, and during that time, up to the breaking out of the war, we had more or less of it every year, but the most we ever suffered was in 1858. I find, from conversing with others, and from my own experience, that it is much worse of warm, dry summers. Much depends, however, on the way or manner in which they are driven. Some drovers seldom have cattle infected with the disease; whilst others always have diseased cattle in their herds. In the course of my profession I have had several very good opportunities, testing this matter. I have heard over one hundred experienced drovers, dealers and farmers, etc., testifying pro and con as to whether it was contagious or not, and also, whether our cattle became infected with it from southern cattle being driven through the country. But one of the best tests I have known, fell under my observation during the war. Previous to the war, the southern cattle were driven through the border counties of this State bordering on Kansas, at least, in the southwest border counties; and we suffered from it, more or less, every year they came through. During the war, no southern cattle were driven through there, and not an instance have I ever heard where one cow died with that disease in that region during that time. But when we got possession of Forts Smith and Gibson, then again the Indian cattle were driven up where 'tis known as the military road, in Kansas, and all along that route they suffered severely from the disease. When in Missouri, twenty miles or even ten miles distant, no such thing occurred. The same could be truthfully said of every other part of Kansas, during that time. Now, again the cattle are brought through these border counties; and the result has been that almost one-half of the cattle in Newton, Jasper, Barton, Vernon and Dade counties, died from the disease this season, and the country where they traveled alone suffered. I am well satisfied, from all that I have seen and learned, that our cattle became infected by grazing where these cattle have grazed. There is one thing held out by the advocates of the traffic which is untrue, that is, that these southern cattle themselves are not diseased. I have handled some and seen many sicken and die with it, yet I believe they are not as subject to it as our native cattle; but they often times have it in their own country, as I have heard several men of experience testify. As to just where the seat of the disease is, I cannot say; but I believe it is in the foot. Old drovers have told me that cattle driven slowly and rested often, would never distemper other cattle, and I have found this to be true. Another thing is, that heavy cattle are almost certain to be diseased with it; while young stock cattle seldom have it if driven prudently.

On examination of cattle diseased, you will find by opening the hoof, that their feet are sore and continually throwing off pus. Some think this disease of the foot is caused by the *"borer"*—a fly that is very numerous in Texas, and in some of the Indian countries—which bores in the heels and feet of animals, and sometimes ruins them.

I think the matter well settled, that the driving of southern cattle through our country is the cause of the disease; but I must confess that I have been at a loss to reason about it, as I would about almost any other subject.

Hoping your communication may result in much good,

I am your obedient servant,

NATHAN BRAY.

FORT SCOTT, November 13, 1868.

HON. SPENCER SMITH, St. Louis, Mo.

Dear Sir:—Your favor of the fourth instant is at hand, and contents noted. In reply, would says, that I have resided at this post since 1843; before the Texas cattle became a trade or traffic. At the Missouri river points north of Fort Scott, when this trade opened, our cattle were all very healthy; but we soon found a change in the health of our cattle. This trade lasted several years, say up to the commencement of the war. Then, all trade seemed to close in Texas cattle. This trade ceased until the war was closed. This trade again opened and our cattle became again unhealthy, at this time, if not before.

Our people became excited against this trade. Our people, wherever Texas cattle passed, lost their cattle. The excitement was such, it went into the legislature of Kansas, and laws were passed justifying the acts of the people in stampeding and driving the cattle back over the line or road they had come into the settlements. During all these number of years, before and since the war, the disease that Texas cattle communicated to our cattle, many hundreds and thousands of our stock have died. Difference of opinion, all this time, was among our people, and is to this day; but I have dealt in cattle, some, all this time, and have lost a good number by this disease, as I then and now believe. I watched the cattle we owned, along the road where the Texas cattle were driven, and those of us who had cattle feeding on these highways, universally lost a portion or all those cattle. One fall, I had upwards of 100 head of beef cattle, designed for the St. Louis market. These cattle were on the range, each side of the road these Texas cattle were drove. I did not disturb my cattle, and let them run. The disease was bad among our cattle that season. I lost quite a number of them from the disease they leave on the grass, from the saliva from their mouths; also when the waters are stagnant or not running. Many experiments have been resorted to, but the most of them failed. On one occasion, we sawed of the horns of some oxen that were very bad off, and matter rushed from the horns after they were sawed off; but very few have ever been saved.

Our cattle are tolerably healthy now; yet, there is some little disease here, and these Texas cattle are occasionally run through our country by night. The laws of Missouri and Kansas are now pretty severe. We are not much troubled. The disease is worse, I think, in dry weather. Much more could be said, and that against Texas cattle, for I have watched it from its commencement.

Very respectfully, yours,

H. T. WILSON.

With more time, I could have accumulated a large amount of evidence (it must be remembered that daily mails are not yet established in the remote districts of Missouri and Kansas) to the same effect, viz: that the passage of a drove of Texas cattle, through a district of country during the summer months, is sufficient to spread disease among our cattle which pass over the same ground within several days after the Texas cattle. The propagation of the disease does not require contact, or inhabiting the same pasture or enclosure for any length of time! but the disease breaks out among our native cattle who have the misfortune to pass over the same ground, or drink from the same ponds used by Texas cattle. I know that it has been stated that "continuous contact, or grazing after them (Texas cattle) is necessary to produce the disease," but I think this can be abundantly disproved, even by members of this convention, from their own personal experience.

How the disease is communicated from these droves to our cattle, I leave to the imaginations of the theory makers.

We have not yet sufficient facts in the case to justify a certain conclusion. We must go on collecting facts for some time yet, and perhaps we shall finally be able to ascertain the true seat of the disease, and the nature of the infection.

To many, it seems preposterous to suppose that healthy Texas cattle can impart a disease to ours which they have not themselves, and that our cattle do not become the medium of conveying this disease to others. It is certainly somewhat strange, but that it is nevertheless possible, I am able to show, through the aid of Dr. Weslizenus, of St. Louis, who has kindly furnished me the following extracts from a German work on pathology—"Pathological Fragments, by Dr. C. W. Stark, Weimar, 1824."

In the ninth chapter, he speaks of infection from healthy persons, and mentions the following facts, for the correctness of which he says he can answer, because he has seen part of them himself, and others have been communicated to him from the highest official authorities of the states concerned.

First. In the year 1812, thirteen Russian prisoners of war, in whom no trace of disease could be found, marched through Prussia and Siberia, and left everywhere at their stopping a malignant, contagious, typhus fever, without being, themselves, even later, affected by it.

Second. From ten to fifteen Russians themselves stopped over night, in Zullichal, in a very small room, crowded together with the landlord and his family. The latter immediately afterwards were attacked by a very malignant typhus fever, of which they all died, and which also spread to the neighboring houses. These Russians were traced for many miles, and some weeks after were found perfectly healthy.

Third. Bands of Austrian prisoners, consisting mostly of Poles and Hungarians, left in Franconia, in 1812, thirteen malignant, contagious diseases behind them.

Fourth. In Greifswald, prisoners of war, consisting of different nations, Germans, Italians, Danes and Frenchmen, confined to a narrow room, badly fed and very filthy, gave the contagious typhus fever to nearly all the inhabitants with whom they came in contact, although they, themselves, did not suffer from the disease.

Fifth. When the remnants of the French army—returning from Russia, bringing with them crowds of sick—marched through Berlin, no disease was spread. But when, in 1813, the corps of Wellzenstein, consisting mostly of Cossacks, Tschergises and Baschkirs, came to Berlin, an epidemic typhus fever broke out.

Sixth. A similar phenomenon was observed the same year in cattle. Droves of Podolian cattle which, after strict examination and quarantine, had been permitted to enter the Prussian states as sound cattle, spread in their entire march through Prussia, Denmark and Mecklenburg, up to the Baltic, the *Vishseuche* (typhus fever of cattle) although not a single animal of the whole drove sickened on the way, but arrived in perfect health in Stratsund, and were slaughtered there as healthy cattle. In similar manner, the typhus of cattle was created in 1814 and 1815, by the numerous droves of cattle following the Austrian armies, and belonging to foreign races.

This singular mode of creating and transferring disease from healthy individuals, occurs mostly when the heterogenous masses of different nations or races come in contact, and might be called nationalizing disease, a process analogous to acclimatization.

Here are evidently the same phenomena which exist in Texas fever, and which were observed long before this disease was known; unless it be that the typhus here spoken of was the same. As to the various opinions about ticks, disease in the hoof, contagion in the breath, etc., they may be all true or false. We have not sufficient evidence to substantiate or disprove them. But that our cattle die from some disease emanating from the droves of Texas cattle, which are either driven here or transported in cars, is undoubtedly true; and that this happens only during the summer months is also true.

A general law, therefore, which would operate alike in all the states, and be just to all parties concerned, seems absolutely demanded.

I beg pardon, Mr. President and gentlemen of the convention, for detaining you so long. I should not have done so had I not felt this matter to be one in which you are as much interested as I am myself.

Mr. Gould, of New York—Mr. President, I am instructed by the committee appointed to draft a series of propositions, which may be enacted into laws, to report that it met at a very early hour this morning; has been in continuous session ever since, and is satisfied that it is entirely impossible to comply with the strict letter of the order of the convention.

I have the honor to report that it has arrived at certain general principles and conclusions, which it has directed sub-committees to report and present to it at once.

I am further directed to state, that it will, in all probability, be able to report this afternoon.

The report was accepted.

Dr. Jones, of Illinois—Mr. President, I offer the following resolution:

Whereas, The disease under consideration is known by the various names of Spanish Fever, Texas Fever, Cattle Plague, Black Water of Texas, etc.; and,

Whereas, We believe that a name characteristic of the disease is desirable; therefore,

Resolved, That a committee be appointed, consisting of Snow, of Rhode Island; Thayer, of Massachusetts; McCall, of Maryland; Mills, of Michigan, and Clendennin, of Ohio, who shall report to this convention a name that shall become uniform, and by which it will be recognized hereafter by the members of this convention.

Leave was granted to add the names of Messrs. Morris, Carson and Morse to the above. The resolution then prevailed.

Dr. Clendennin, of Ohio—Mr. President, I should like to introduce a resolution somewhat to this effect: That this convention do directly, or through the officials of the several states here represented, recommend to Congress the appointment of a commission, which shall be composed of such persons as shall be thought proper, for the purpose of fully investigating the causes, symptoms, and everything relating to this disease; with power to go to Texas and the Indian Nation, and whose duty it shall be to make a thorough investigation of the whole subject, and report to Congress.

The President—You will please reduce the resolution to writing, sir.

Dr. Clendennin—I will amend the suggestion that I have just made by moving that a committee of three or five, or as many as may be thought proper, be appointed to draw a resolution asking congress to take such action as it may deem proper.

Gen. Patrick, of New York—One word, Mr. President, before that is put. I would suggest whether we could not, without the machinery of a special commission and appropriation by congress, reach the same result as that sought to be accomplished by the gentleman.

You are all aware, undoubtedly, that whenever an appropriation is made by congress for any especial purpose, there is always a grab for the spoils; and no appropriation that ever I heard of remained unexhausted.

Again, the general-in-chief of the army, or the secretary of war—

Dr. Clendennin—I said nothing in reference to the army, sir at all.

Gen. Patrick—I am perfectly well aware of that, sir; and therefore, I am about to speak of it now.

What I was about to say, Mr. President, is this: That the machinery is already on hand; and so to speak, owned by the government. The army contains, at every post, gentlemen well versed in all the sciences in which a commission to investigate this matter should be versed. If they do not happen to be stationed at the exact point where such a commission would pursue its labors, they could be very easily ordered there. All these things are under the control of the war department; and it does seem to me that this is the proper department for us to look to, in order that this subject may be thoroughly investigated, and a report presented at the earliest possible day.

Dr. Morse, of Missouri—As an amendment to the resolution, Mr. President, I would strike out the word "congress" and insert "war department."

The President—Reduce your amendment to writing, sir.

Mr. Hamilton, of Pennsylvania—Mr. President, I move to strike out the word "war department" and insert "commissioner of agriculture."

Dr. Clendennin, of Ohio—Mr. President, I merely desired, in offering that resolution, that a committee might be appointed who should petition congress to take some action in reference to this disease.

With reference to the matter being referred to the war department, I merely wish to state that

I have some experience regarding frontier posts, from the officers at which the proposed commission might be organized. The highest ranking officer in command is perhaps a captain, but in many cases a lieutenant—the only medical officer at such a post being an assistant surgeon of two or three years standing, who left college and went directly into the army, without then having had or having gained since, any experience worth mentioning, in conjunction with that which should be possessed by those to whom the consideration of this matter should be referred. It is but fair to presume that the other officers stationed at these posts are of about the same class. The value of the commission will depend upon the talent of which it is composed. I do not mean to say that there are not very intelligent and highly educated gentlemen in the army—every body knows that there are.

Dr. Morse, of Missouri—Mr. President, I believe, for one, that if this matter were confided to the war department, is would detail persons competent for the work. Here is another point that should be considered as a reason why the war department should have charge of this. A great deal of that Texan country is not by any means in a settled condition, and it strikes me that it would be rather difficult to find two or three men to go down there, unprotected as they would be to to a very great extent; whereas, if the army takes the matter in hand it is already equipped for any emergency.

Dr. Clendennin, of Ohio—It seems to me, Mr. President, that if congress takes any action in the matter, it will appoint such persons as will be entirely competent. It seems to me that the people of Texas (where as has already been remarked, harmony has not yet been quite restored) would gladly furnish to such a commission all the information in their power, and, of course, such commission would command and be able to obtain the protection of the military posts in that state. It seems to me perfectly proper that this matter should be presented to congress, and that it should designate who, or what department should act in the premises.

The President—The question is on the amendment of the gentleman from Missouri (Dr. Morse), striking out "congress" and inserting "war department." The amendment prevailed.

Mr. Stockdale, of Ohio—I hope, Mr. President, that the house will vote down the resolution. I believe we can get as good a report from this convention as from congress, as we have all the testimony here. I hope that the convention will, itself, appoint a committee to report in regard to all the matters within the scope of the resolution.

Prof. Chadbourne, of Wisconsin—I hope, Mr. President, that the resolution will not be voted down, for I am satisfied that a long series of observations, by men accustomed and trained to observe, must be first made before any action can be taken regarding the matter, with any degree of certainty. We must first secure the facts, and I do not believe that there are many medical men in our frontier posts, at all competent to secure the particular kind of facts which we must have before we can arrive at any kind of a safe conclusion with reference to this disease.

The President—The amendment of the gentleman from Missouri (Mr. Smith), striking out "war department" and inserting "commissioner of agriculture," is now in order.

Mr. Reynolds, of Illinois—I understand, Mr. President, that the department of agriculture is already doing this very thing—why, then, should we memorialize the commissioner of agriculture at all.

Dr. Miles, of Michigan—Mr. President, I hope this amendment will not prevail. The circulars sent out by the department of agriculture, signed as they are by irresponsible or interested parties, will not enable us to come to any definite conclusion with regard to this disease. We want to know something accurately, something that can be relied upon, regarding its extent, the precise conditions under which if is developed and the means by which it can be controlled. I voted for the amendment inserting "war department" instead of "congress," simply for this reason, that I am satisfied it would be almost impossible to get the matter before congress in a shape that would produce any satisfactory result. There are plenty of men in the army fitted to make these investigations, and if they do not happen to be at the posts where these inquiries are to be made, the war department can order them there; or if there are men now at those posts not entirely qualified, the war department will assign those who are. Besides, we shall have a report very much sooner, if conducted under its auspices, than we shall be able to obtain if the matter be intrusted anywhere else. I am entirely satisfied that we should not get any report from a commission appointed by congress in less than three or four years, while what we want is something right away.

The sending out of a commission from this body, seems to me, cannot be undertaken, simply for the reason that the expenses of such a commission must be paid, and I am not aware of any method by which we can raise the funds in this body.

Gen. Patrick, of New York—Mr. President, my suggestion, for it was such, regarding the war department, will not militate against a commission finally.

What the gentleman from Ohio (Dr. Clendennin), and the gentleman from Wisconsin (Mr.

Chadbourne), have said, is in a great measure true, and especially so since the war and the enlargement of the army.

At the present time many of the junior officers and of the medical staff have been but recently taken from civil life, in consequence of the exigencies of the services, and put forward of necessity. But go you back to those of higher rank—to the scientific corps of the army—to the old officers of the medical department, of the engineer and topographical corps, and of the ordnance department, and you will not find their superiors in the sciences to which they have devoted themselves. The chief engineer of the army, to whom this matter would naturally be referred, is a man not only associated with all the scientific societies of this country, but whose name is widely known in Europe. He (in former times, at least, it would have been so), in consultation with what is termed the staff corps of the army, selects from the scientific corps those gentlemen who have made special attainment in the specialty of their respective professions. To each of these small commissions gentlemen from civil life are attached, as the botanist, the historiagrapher, etc.

The special reasons why I wish this matter referred to the war department, have been already partially covered—such as the difficulty of reaching these points, without the aid of the officers and troops of the army. It, is true that any one, going out clothed with authority by congress, must, of necessity, be received. But, gentlemen, you are perfectly aware what a difference there would be in the reception of a commission composed of civilians and one composed of those already perfectly at home in these fields, to whom that information would be most gladly afforded, which the people would be somewhat doubtful about furnishing to others.

A word, now, gentlemen, in regard to this commissioner of agriculture, for I have had some little experience with that gentleman. In regard to the facilities which the war department could place at our disposal, I happen to know a little something, for in times past I have had considerable experience regarding the formation of commissions like that which we now wish to send out.

But to go back a little. We had thought of such a commission as this, and I, as the chairman of our organization, wrote to one of the officers of the subsistence department, as an old associate of the gentleman in question, stating to him what we had already discovered, and suggesting that quietly and without going through any red-tape business, he could give us an order applying through the whole southwest, and such other places as we would be likely to visit, whereby medical officers at the different posts might, if competent, be detailed to accompany us; and, by the way, at many of the posts, were some of the old officers perfectly *au fait* in this business.

I also wrote to an officer, high in rank, in the medical department, saying to him in the same spirit? "I have written," so and so, "and you can work together in carrying out what will be in its results a great contribution to sanitary science generally."

Unfortunately, the first mentioned officer was absent on a tour of inspection through the west, which would consume several months. The subordinate into whose hands it fell, not knowing much about such business, went, as a matter of course, to the commissioner of agriculture. That functionary responded substantially: "No, sir, no, sir, I have sent out Prof. Gamgee; he knows everything; he will make a report; don't interfere with this thing; I have got it now, and it belongs rightfully to the agricultural bureau."

What was the result? The commissioner of agriculture says it will be January before an appropriation can be made; nobody knows how long before the plates will come out, or what the report will be worth when it does appear—speaking with all respect of Prof. Gamgee.

MR. SMITH, of Missouri—I withdraw the amendment, Mr. President, that I proposed a little while ago, and offer the following as a substitute for the whole resolution, as amended:

Resolved, That this convention appoint a commission of three to investigate the cause and geographical distribution of the so-called Texas cattle fever, and that congress be memorialized to furnish the necessary means and power for carrying on this investigation.

MR. ——, of ——.—Mr. President, I move that this whole matter be laid over for the present.

The motion prevailed.

Whereupon the convention adjourned until 2:30 P. M.

AFTERNOON SESSION.

WEDNESDAY, December 2, 1868.

THE PRESIDENT—The convention will come to order. It seems to be generally understood, gentlemen, that this afternoon we are to hear from Dr. Morris, who has been engaged for the last four or five months, as an officer of the board of health of New York, in most thoroughly investigating certain phases of the Texas cattle fever. Will that gentleman be kind enough to take his stand upon the platform, where he can be distinctly heard by all.

DR. MORRIS, of New York—Mr. President and gentlemen, I rise before you in the humble capacity of a sanitary officer of the metropolitan board of health of the metropolitan district of the state of New York, delegated by that body at the urgent request of the honorable the chairman of the commissioners upon cattle diseases of the state of New York, who have so cordially, kindly and efficiently cooperated with the metropolitan board of health in pursuing the scientific investigations, as directed by its officers, and the control of diseased meats brought into their markets.

Those investigations have not been pursued in any captious spirit, or from any interested motive, but as part of the duty pertaining to a scientific sanitary organization, combined to study, elucidate and apply to great sanitary laws which govern our well being as a nation.

The cattle yards at East Liberty, near Pittsburg, under the control of the Pennsylvania Central Railroad, the chief places where cattle are shipped on the several western roads, and especially the experience at Chicago and at St. Louis, were interrogated immediately after the disease came under observation at New York. The mayor and the head inspectors at Pittsburg, Dr. John H. Rauch, the sanitary superintendent at Chicago, Dr. Neil, the health officer at Dayton, Ohio, and Professor Gamgee, at once responded to requests for information, and so did a great number of gentlemen connected with the local government of towns to which the board sent inquiries. Information was sought from nearly two hundred separate sources. The general result of all this inquiry appears to have been simply this: First, the period of incubation of the poison which produces the disease was ascertained, by the same kind of evidence which is now in the hands of all of us, to be a variable period, not less, perhaps, than fifteen days in any of the histories reported, oftenest more than twenty days, and certainly extending to forty days and upwards. This was important information for us in the early part of August, while the disease was regarded as somewhat mysterious. Dr. Rauch, in his letter, dated August 19, stated that sixty-two cows had died of the disease in the fifth ward of Chicago, and that its presence had been recognised there from the first of that month. Dr. Hodges, president of the board of health of St. Louis, communicated important records of the disease, as it had prevailed in former years near St. Louis, and various parts of Missouri. Dr. Neal, health officer of Dayton, Ohio, communicated the result of his observations, from day to day, upon the disease which had infected a herd near that city. F. A. Atkins, Esq., of Odell, Illinois, gave the history of events which were occurring in his neighborhood. The experience in Warren county, Indiana, and in Summit county, Ohio, was kindly made known to the New York sanitary board. Like the record of each infected herd, and each diseased animal which came under the investigation of this board, all this experience gathered by correspondence, tended to clear up all doubts as to the dependence of the disease upon a contagious principle which could, in all cases be traced to the Texas cattle, so far as regards the first group of cases which occurred within the first sixty days after exposure of native cattle to the excrement or the trails of those cattle. The sudden and very brief duration of the obvious symptoms, or very last and fatal stage of the disease, seemed fully confirmed. Not a single person among all of the correspondents, who gave us the result of their observations, seemed able to mention any symptoms that could be discovered before this last stage of sickness is reached.

Dr. Neal, of Dayton, Ohio, writes, under date of August: "Up to the time of receiving your letter in behalf of the metropolitan board of health we had no indication of the disease in our midst, but there being a herd of Texas cattle a few miles from us, in due time we have been doomed to suffer. Between August 15th and 25th, eleven native cattle have died, and several are now sick." Mr. Atkins, of Odell, Illinois, states his conviction "that even the filthy cars of the cattle trains of our railroads would become the carriers of the infection from Texas steers.

Whatever was learned from any part of the country concerning this disease, confirms the opinion that there should be thorough disinfection of cattle yards and cattle cars and trains. Hence the sanitary officers of the State of New York did not act blindly when they advised such effectual disinfection by carbolic acid. Whatever the general government may have acquired in its correspondence respecting these diseases, the sanitary officers in New York have deemed it a duty to maintain an independent correspondence, and obtain all the information in their power, and especially to ascertain, if possible, all the facts concerned in the propagation and prevention of the disease.

We begin to fear that there is evidence that the poison from the south may, under favoring circumstances, become naturalized, even in the State of New York, and many other States where large numbers of cattle are accumulated. But it should be mentioned that up to this date the registrar of the metropolitan board of health states that there has been nothing received in the correspondence of the board with the sanitary authorities in other States, which throws much light upon the subject, for the observers who have communicated information upon this point all testify that they have not witnessed the repropagation by the northern cattle; but that it must be remarked that few observers have been so situated that they could study the disease, except in connection with the first group of animals that became infected by it from the excrement of the Texas cattle. The registrar says that the evidence upon this subject must be regarded, thus far, simply in the light of purely negative evidence, and that this vexed question is by no means settled until exact and searching observation shall have been carefully made wherever the disease has been carried.

BRIEF SUMMARY OF THE WORK ACCOMPLISHED BY THE METROPOLITAN BOARD OF HEALTH ON THE CATTLE DISEASE.

The markets of the metropolitan district of New York demand about 1200 to 1500 head of beef cattle every day, Hence it is plain that its sanitary authorities could not, without culpable negligence, neglect to notice, and, if possible, to prevent, the introduction and use of diseased animals for food. When the fact was announced that a destructive disease was spreading among the herds in the very districts from which the choicest meats were supplied to the New York markets; and when it became known, one of the most trustworthy sources of this supply, viz: Mr. Alexander's herds—had already sent an invoice of diseased cattle to this market, the metropolitan sanitary officers lost no time in deciding upon the necessary inquiries and the police regulations which seemed necessary to ascertain the nature and results of this disease, so far as its influence upon human health was concerned.

These duties, though purely sanitary, had to be classified under different heads, as follows:

1st. Inspection of the cattle, whether dead or alive. 2d. Inquiries as to whence they came, and as to what regions were being visited by the disease. 3d. A scientific investigation into the essential nature of the pathology of the disease.

The very first group of diseased cattle which sanitary officers examined, viz: the dying remnant of Mr. Alexander's herd, which reached Communipaw on Friday morning, the 7th day of August last, and that left Homer, Illinois, about one week previous to that date, plainly enough settled the question that this disease is a pestilence that needs all of the sanitary care and all of the scientific investigation it can receive. Now these duties were not likely to be well performed, or even to be performed at all, in any good season, if left to the slow movement of State and national authorities alone. Investigations had to be commenced at once, and were commenced.

The department of inspector speedily grew into an important work of police control, and as soon as the New York State commissioners, Messrs. Patrick, Gould and Allen, had learned the extent of the malady among the cattle, viz: in the third week in August, they nobly came to the aid of the metropolitan health authorities, and added the power of the State to that local power which the sanitary officers had exercised for the preceding ten days.

The first diseased cattle were discovered on the morning of August 9th, in the drove yards at Communipaw, New Jersey. By the use of the thermometer, it was immediately discovered to be a pestilential disease, for the temperature of some of the cattle that had begun to manifest the symptoms of it, was found to be above 107° Fahrenheit, a temperature which pertains only to the operation of pestilential poisons in the animal system. Let it here be remarked that an intelligent health officer, whose business it is to examine and investigate diseases, never goes about such duties without a thermometer in his pocket. It should be understood that medical officers fear diseased food, not because it produces, ordinarily, its own like in human beings who eat it, but because it tends to produce obstinate and fatal diarrhœas, subtle and fatal changes in the human blood. In short, because it is filthy and unhealthful to eat diseased and putrid articles of food. It should be remembered just here, that there was, during the last week of July and first ten days of August, an alarming and dreadful increase in the mortality from diarrhœal disorders and sudden deaths, which demanded searching sanitary inquiry.

The inspection and police control of all meat cattle brought within the limits of the metropolitan district of New York (which embraces five counties), having been provided for by appointment of myself, a sanitary inspector of the metropolitan board of health, as assistant commissioner for the State, this branch of work was so organized, and authority so concentrated, that it at once prevented panic, fault-finding, and all the chief sources of danger from the arrival of cattle.

PLANS OF ORGANIZATION.

All cattle arriving within the city limits were required to enter quarantine yards for inspection and were not allowed to leave without a permit, stating that such inspection had been made, and signed by the assistant commissioner.

SCIENTIFIC AND SANITARY INVESTIGATIONS.

Careful post mortem examinations at the slaughtering of diseased animals were commenced August 9th, in the herd of one hundred and forty-one which Mr. J. F. Alexander's agent, Mr. Fitch, at Communipaw, ordered to be sacrificed (and here let me say, by the way, that this sacrifice was, under the circumstances, one of those noble acts which redeem manhood from the degeneration of traffic in these days of selfishness.) Some thirty carcasses were examined the first day, and three were subjected to searching analytical inspection. The *blood*, the *bile*, the *liver*, the *spleen*, the *flesh*, and the intestinal contents, were also subjected to the most skillful microscopical examination. Even the tick was examined, unworthy as he was of such attention, for we now know that he was an old enemy, familiar to the eye of herdmen in many countries. The chief result reached in these microscopical examinations was summed up as follows. In a note from Prof. R. Cresson Stiles, deputy registrar of the metropolitan board of health, to the superintendent of the scientific work, Dr. Elisha Harris, on the next day, says:

"Concerning the *blood*, I found it decomposed so that the specimen I secured (poured from the bottle containing the clots) consisted of a bloody serum. *Not a single red blood disk could be detected.* The red blood disks had parted with their coloring matter, and the serum was of a dark mahogany color. This evidence of disorganization of the blood is a *most important fact*, as indicating the nature of the disorder." Ordinary observation by the unaided eye showed, of course, precisely the changes which all have seen who have examined the disease in that way—the sloughs in the lead, or rennet, or fourth stomach, the darkened mahogany color of the soft muscles, the greenish ochre yellow of the fat, the thick, flaky, almost black, condition of the bile, and its enormous excess in quantity in the gall bladder, the bloody urine, the enlarged and altered appearance of the liver, and the still greater enlargement of the spleen, the bloody straining of the rectum, the jaundiced eye of the diseased creature. But to the critical eye of pathologists and trained medical officers of the board of health, there were no changes discovered in the tissues and organs of these dieased animals that were not plainly attributable to the changes that had occurred in the blood, unless, indeed, it might be, as it possibly was, true, that the liver, the bile, the spleen and the flowing blood, together, were in some way materially responsible for this destruction of animal life. Here, then, commenced the study which has continued, uninterruptedly, from the 9th of August until late in November.

There were three objects to be obtained by this study, in which not the medical profession alone, but all interested in healthy food supply and in profitable cattle raising, herding, grazing, transportation and marketing, may have an equal interest, at least in the two objects we will here first mention. The first object was to ascertain if the disease could be propagated to other animals. The second object was to ascertain by what particular agent or thing, in itself considered, this disease is communicated from one animal to another. Thirdly, to ascertain the precise changes which the disease produces in the fluids and tissues of the animal, and especially to study these changes in such a manner as to ascertain some of the important facts regarding the spreading of pestilential diseases of both men and the lower animals. Under the first head, only a few experiments were undertaken. Mice, rabbits and dogs were fed with portions of the liver, or of the bile, in small quantities, but only in the rabbits was definite evidence of deadly effects produced. Out of a large number of rabbits fed, all excepting one, died with symptoms so closely resembling the cattle disease as to leave but little doubt that they were poisoned by it, and this, too, in a very definite and specific manner. This point will be noticed when we come to speak of the parasite which is a constant attendant upon the disease in the blood and bile of the diseased animals. Under the second head for study, the microscope was put to the test to discover if the intestinal contents of the diseased cattle contained anything that might account for the spreading of the disease. But this was so much like looking for a needle in a haystack, that it became expedient to make the search principally in the contents of the gall bladder, for whatever is contained therein is sure to be poured out into the intestines. This search has been amply rewarded, for on the 13th day of August, in examining the bile of a number of badly diseased animals that were being examined in our presence, near the Hackensack river, the microscope, in the skillful hands of Dr. Stiles, revealed the presence of fungus spores, which, in the language of the scientific men who give names to these things, would be called *Cryptococci*, but in common phraseology may be simply said to resemble the yeast fungus.

We wish to be distinctly understood here, that we do not suppose that it was yeast fungus—indeed it was not; but it has at last been ascertained to be the spore germs of a minute parasite called the *pittelia caries*, and which has its natural home about the husks and joints of certain grasses and herbage growing in warm latitudes. But in the fluids of the living animal, within the cavities of its organs of digestion, these microscopic growths do not attain that full development which they bore in the outside world; but, as the microscopists and vegetable physiologists tell us, regarding the minute organisms of the vegetable creation, the ready method which these spores of minute parasites adopt in their re-propagation or increase, when not growing upon their natural soil or elements, is simply to multiply as cells, by growing and breaking up or dividing with enormous rapidity, using whatever elements they float in for sustaining this increase of theirs. And this is the way these little fungus spores grow in the blood and the bile of the diseased animals. We should hear mention that the spores were found abundant in the blood, as well as in the bile, of every diseased animal that has been slaughtered, or found dead of this disease, within the metropolitan district. It should be further stated that these spores were found abundantly in the blood freshly drawn from the cervical vein of the sick animal when alive, and that although found in every drop of bile immediately after slaughtering, the same specimen of bile would present a vastly increased quantity of these little fungus growths after exposure for a day or two in bottles, or in the open air. Of course it was very desirable to know to what class of microscopic parasites which grow in the open air, and upon green herbage, these spores or seeds belong. In other words, these spores must be planted, to see what kind of plants they would produce. They were planted in every kind of way, in every kind of soil: as the fresh-cut slice of an apple, the inside rind of an orange, the clean washed, rancous surface of an intestine of a freshly killed healthy animal; they were planted in a mixture of sugar and of gum, in water, and upon hard caked bread, upon clean glass, etc., etc.; and upon favorable soil they grew to perfection, which is illustrated upon sketches here presented. They bore seed—that is, spores—which were precisely like the seed or spores originally planted. Thus, in various ways, by nice experimentation, there has been a very satisfactory identification and discovery of *the name and nature* of the microscopic parisite, to which these still more minute and microscopic spores or seed belong.

So much for the revelations of the microscope. This field of study was deliberately surveyed, and these inquiries planned: *First*, with the design of discovering whatever might be discovered concerning the propagation of this minute organism; and *secondly*, it was hoped that the relations of this spore to some fugus growth in the vegetable world might be ascertained, with which the Texas cattle were concerned. A far greater degree of success than was expected seems to have attended their line of inquiry. The medical officers who planned and directed it were sufficiently masters of the present state of scientific knowledge on these and kindred subjects to grasp the whole problem, and make no mistakes. Indeed, it has come to pass, since the last outbreak of cholera in its march across the continent, in 1865, 1866 and 1867, that this kind of exact inquiry has come to be a part of the duty of scientific medical officers. No one need be told that if this very parasite, which, in its lowest and most rapid stages of development, has now been found in the blood and bile of Illinois cattle that took the disease by feeding over the ground where the Texas cattle dropped their excrement, has now, indeed, been almost absolutely demonstrated to be the seed which is borne in the spore-vessels of a parasite, which grows upon grasses and herbage on which the Texas herds graze when *en route* from the bottom lands of the south to the prairies of Illinois and Indiana. We have an equally good demonstration that the food upon which the Texas cattle feed is at least partly responsible for the spread of the deadly infection. Yet it is due to Dr. Harris, as the author of this generalization, to say that he believes that the parasite may be guilty of only half the evil; for in cattle mercifully treated, and properly fed, it is impossible that the blood and fluids would become over-run with this poison. Chemistry, the hand-maid of modern physiology, has been required to interpret such changes as it could take cognisance of, in the blood, bile, liver and spleen of the diseased animals. Over fifty very careful analyses have been made by Prof. C. F. Chandler, chemist to the metropolitan board of health, and superintendent of school mines of Columbia college. The general result of all this labor in the laboratory may be stated as follows: The blood becomes watery, (that is, loses the normal amount of its solid constituents, and loses them very rapidly in the last or obvious stages of the disease;) 2nd, in animals killed when convalescing from the disease, the chemist found the blood excessively watery—the blood corpuscles being in a proportion less than one-half the normal standard, and the albuminous portion of the blood very much diminished. I am permitted by the board of health to quote from the record of Prof. Chandler's analysis the following illustrative result:

	Water.	Total solids.	Fibrin.	Red corpuscle.	Albumen.	Salts.
No. 1—Sick ox, slaughtered in the last stage of the disease	888.9	111.1	5.6	None.	89.5	3.1
No. 2—Sick ox, slaughtered in the very last stage of the disease—a typical case of the disease, 60 days from incubation..	876.9	123.1	7.8	13.6	60.8	14.1
No. 3—Ox killed on the eighth day of convalescence—one of Mr. Alexander's herd, from Homer, Illinois...........	854.	134.1	10.9	41.6	68.	5.6

Chemistry and the microscope, also, revealed the fact that the liver in the diseased animal is undergoing what is termed fatty degeneration. The extent of this change varies considerably in different animals, but it is a very invariable and constant change. The microscope shows that it consists simply in the deposit of fat in the minute cells of the liver, precisely as occurs when certain poisons are fed to animals.

The bile is secreted in excessive quantity, and is proved by very nice experiments to be so poisonous that if a very small quantity of it enters into circulation of the blood, that the blood corpuscles would be quickly destroyed by it; and this proves to be the fact. The greenish and dark *ochry color* of the fat and other light tissues, and the mahogany color of the muscles is found to be due to this admixture of bile and the breaking down of the red corpuscles.

This is proved in many ways, but in none so beautifully as in one of results which is here shown by a microscopic view of crystals of hernatoidine, which can only be produced by the destruction of the red corpuscles in particular ways. This result of blood destruction is found in various tissues of the body, but nowhere so abundantly as in the liver, the spleen and the bile. Perhaps these might be considered as experiments of science too nice to be useful, but, far from this, they are among the most definite, accurate and trustworthy guides to the treatment which the whole subject of this inquiry upon the cattle disease should receive.

To any person who will carefully look into this subject from the standpoint we have here indicated as having been occupied by the medical officers of the metropolitan board of health, and which, let it be said to the honor of the non-medical but most enlightened gentlemen who constitute the cattle commissioners of the State of New York, are heartily appreciated by them, it will plainly appear that whatever knowledge is required in this broad and fruitful field of scientific researches concerning this contagious but most anomalous disease, will contribute directly and greatly to the welfare of mankind, by adding knowledge in a field where knowledge is most difficult to be obtained, concerning the mysteries of pestilences and contagions which afflict the human family.

THE PRESERVATION OF COLORED SKETCHES TO ILLUSTRATE THE MORBID ANATOMY OF THIS DISEASE.

After viewing the first dissections of diseased cattle, on the 9th of August the registrar of the board of health of the metropolitan district, who had direction of this investigation, employed Mr. Kohlen, a skillful artist, whose life has been devoted to painting automatic sketches from nature, to take drawing at the time and place of slaughter of the diseased animals. Nearly one hundred such illustrations have been taken; and of these, upwards of fifty are being cromo-lithographed, and will be soon in the hands of all who take an interest in studying this subject. They will illustrate the report of the Metropolitan Board of Health, and the special report which the New York Cattle Plague Commissioners are preparing, as well as the N. Y. State Agricultural Society's report, which will embody a special contribution for the New York state commissioners. In conclusion, it should be said that all this investigation in New York has been pursued simply in the ordinary course of the administration of the new sanitary government. Then no one man claims any distinction or honor in it; and whatever contributions the medical officers of that board are now about to make to a practical and scientific knowledge of this disease, will be made without any pretension.

Prof. Chadbourne, of Wisconsin—I would like, Mr. President, to ask the gentleman one question: if he understands that the spores are produced by this plant, when growing in the air, in orange peel, apple, etc., are like the cells that propagate by subdivision in the blood and in the bile of the animal?

Dr. Morris—They take a different form of development in the open air, sir. In the blood and bile, they simply multiply as spores, by division, never progressing any further.

Prof. Chadbourne—You consider them as true spores that multiply in the blood and bile.

Dr. Morris—Yes, sir; the spore seed never progressing any further in development in that condition; but when planted in the air at certain temperatures, they develop into the plant from which they originally came, or into those forms of plants.

Mr. Gould, of New York—I would like to ask you, sir, if these plants, thus grown in the open air, do not develop spores, while growing, which are identical with those found in the blood.

Dr. Morris—They do, sir, as will be seen by the plates.

The President—I should like to hear (and I know that it is the desire of the convention) from Dr. Rauch, of the Chicago Board of Health.

Dr. Rauch—Mr. President and gentlemen, I will not occupy your attention for a great length of time, but give, in as concise a manner as possible, the action and observations of the Board of Health of Chicago, and, as far as I can, corroborate the statements made by Mr. Gould and Dr. Morris with regard to the microscopical investigations into the nature and character of this disease by the Metropolitan Board of Health of New York, as substantiated by those carried on by the Board of Health of Chicago; and also, for the purpose of making their history of this plague as complete as possible, I will call your attention to facts not heretofore mentioned.

The first case at the Union Stock Yards which terminated fatally, occurred July 25th, soon after the arrival of the train that brought the animal there. Two days after, two dead steers were found in a train that arrived from the infected district (Tolono, in Central Illinois), with several animals suffering from the disease. The next day, another train arrived with diseased steers in it. This train was not permitted to remain. On July 29th, a cow died belonging to a citizen of the fifth ward. In the meantime, a commission was sent to Tolono, Cairo and other places where the disease prevailed. by the packer's association. This commission retured to Chicago August 4th, and it was supposed that owing to the opposition of the people living along the line of the Illinois Central railroad, no more Texas cattle would be sent to Chicago, and that we need have no fears about the disease. This was before much was known about its spread and character. Hearing that there were cases of the Texas fever at the Union Stock Yards, I directed the health officer, Mr. Burnam, to visit the place. This he did August 2d. and reported no diseased animals. On the 3d inst., another cow died near the stock yards. I then directed the sanitary inspector of that ward, Dr. Mannheimer, to investigate the nature of this disease, and at the same time, instructed the health officer and sanitary policemen of the ward to assist Dr. Mannheimer in every way, in obtaining information.

I visited the stock yards, and at the meeting of the board, August 11th, I called attention to the fact that cows were dying in the neighborhood of the stock yards, and also, to the action already taken; when further investigation was ordered, and such steps taken to prevent the spread of the disease, and at the same time to prevent the introduction of the meat of diseased animals into the market. I had, also, directed that every facility should be given, and all assistance rendered to Professor Gamgee, who was investigating this disease for the agricultural bureau at Washington.

The number of deaths increased daily until the 20th of August, particularly in the fifth ward, when they began to diminish. In order that you may understand the history of this plague, I will state that the fifth ward comprises a large territory, the greater portion of which is unoccupied and in its primitive state, in the extreme southwestern portion of the city, adjoining the Union Stock Yards, and where, for the purpose of economy, herds of Texas cattle were grazed at intervals while awaiting sale, from the month of May until the action of the board prevented it, in August. These animals were also grazed upon the prairie, east, south, and west of the stock yards. No herds were, at any time, permitted to graze east of Pittsburgh and Fort Wayne railroad, for purposes of convenience, and very fortunately for the citizens of the southern division of the city, as undoubtedly the mortality would have been much greater. On this ground, the cows belonging to the fifth ward grazed, and where the Texas fever prevailed most, and where the greatest mortality occurred. A large number of cows grazed east of the Ptttsburgh and Fort Wayne railroad, but none of these were affected, with the exception of a few, which were in the habit of frequenting a spot below the city limits, on the line of the Illinois Central, and Michigan Central railroad, connecting with the stock yards, where the cattle cars where cleaned. These cows belong to citizens of the fourth ward. Other cases occurred near Calumet, Junction, Summit, Lyons, and south and west of the stock yards, where herds of Texas cattle had been driven, or grazed, or where infected native cattle had been sent from the stock yards. One case occurred in the seventh ward, of a cow, that had been purchased several days before from a farmer living near Brighton, but which, at the time of purchase, showed no signs of the disease. As far as we have been able to learn, 147 milch cows, one heifer and four steers belonging to citizens of the fifth ward died between July 20th and October 10th. At the stock yards thirteen steers died; in the fourth ward (the extreme southern ward of the city, and east of the stock yards), ten; outside of the city limits and near the stock yards, fifty-three; and in other parts of Cook county as far as heard from, ninety-five. Of the animals condemned and killed at the slaughter houses, there were seventy-eight. In these the disease was so well marked that it was unmistakable, while a great many were found in the incipient, and still more in the convalescent stages, so that the board did not feel warranted in condemning the animals. This was particularly the case with regard to the Texas cattle. Six of these were found suffering with the acute symptoms, so well marked, that they were condemned; making a total of 401 animals that died of this disease, and were slaughtered within the limits of Cook county.

Much difficulty was experienced, at the outset, in obtaining reliable information, owing to diversity of opinion and conflicting interests. (We literally knew nothing about it). In fact, so much was this the case, that it was soon discovered that it was necessary to exclude all cattle coming from infected districts, whether native or Texas, from the stock yards; to quarantine all Texas and suspected native cattle that were there; to prevent the herding of Texas cattle in the vicinity; and in order to protect other points, to prevent the departure from the stock yards of Texas and other animals with regard to whose condition any doubt was entertained, as in the early stages of the disease, it was found impossible to tell by external appearances whether the cattle were affected or not. An inspector was appointed at the Union Stock Yards, and no animals were permitted to be removed without his certificate, either for the home or distant market. It was soon found that even these precautions were not sufficient to keep the meat of diseased animals out of the market. Inspectors were placed at all the slaughter houses, and the internal organs, paticularly the spleen, liver and bladder of all cattle slaughtered were examined; and at the suggestion of Professor Gamgee, the spleens were weighed, as enlargement of this organ was always present in this disease, and it was supposed to be the best way of diagnosing it. In a few days the livers were ordered to be weighed and a record in both instances kept; and for the purpose of learning as much as possible with regard to the history of all animals received, the inspector at the stock yards furnished a daily report from whence they came, their condition, etc., which facts were also embraced in his certificate, which was taken by the parties purchasing animals to be slaughtered, and the number compared with those brought to the slaughter house by the inspector there, so that none were taken there without undergoing inspection.

I visited the stock yards daily and the slaughter houses twice a day; and in order to make this inspection as perfect as possible, the spleens, and frequently the livers of all the animals slaughtered, were retained for my inspection and comparison with the number in the certificate. Reports were also required, from the wholesale dealers in meat throughout the city, of the number and from whom the carcasses of beef came that they sold, so that, in this way, all the animals brought to Chicago were known, and in what manner they were disposed of.

The stock yard and railroad authorities heartily co-operated, and in a short time the stock men and the butchers acquiesced, so that very soon confidence was restored, and the trade was improved. Whenever an animal was found that showed positive or suspected signs of disease, my attention was called to it, in my visits to the slaughter houses, and if the suspicion of the inspector was confirmed, the carcass was consigned to the rendering tank. But little opposition was made by the owners; and as a general rule they cheerfully acquiesced in the decision. Such was the excitement with regard to diseased beef that the consumption rapidly fell off, and with it the price, and as a necessary consequence great stagnation of the trade. The efforts of the board soon restored confidence, and with it a more hearty co-operation and acquiescence in its orders by all parties interested. Detectives were also employed, as it was discovered that the carcasses of animals were brought in from the country, that had been suffering from this disease. This was soon broken up, and in a few days the entire beef supply of the city was under the control of the board; and I have yet to learn of a case of the Texas fever that occurred elsewhere from cattle that were shipped from the stock yards, after this system of inspection was inaugurated.

So far no notice in the description of the symptoms of this disease has been taken of the chill by which it is ushered in, nor of the difficulty of urination. With regard to the first symptom, I would state that three cases fell under my observation in which this was well marked, and I have no doubt but that such was the case in nearly all of the animals that suffered. In studying diseases of animals, much difficulty is experienced from the fact of their not being constantly under observation, and nothing can be learned but by physical examination. Generally speaking, the first evidence that the owners of cows noticed, was a diminution of the secretion of the milk. There was not that aggravation of the symptoms in the animals, observed at Chicago, which was seen at New York. This was, no doubt, owing to the hardships and exposure incident to the mode of their transportation; and from what I have seen myself, both at Chicago and New York, I am satisfied that in many cases if the animals had been allowed to remain on the pastures undisturbed, they would not have died.

Nearly all the cattle I saw were free from ticks, and none could be found, special care being taken from the outset to ascertain whether these insects had any agency in causing this disease. As a general rule, none were found, and not a trace of them could be found in the stomach of animals that died of this disease, or in any that were killed. Dr. Mannheimer devoted much time to the investigation of this question, and such was also the result of the observation of others, among them Prof. Gamgee, and Mr. Emery of the *Prairie Farmer*.

From August 3d, to October 10th, Dr. Mannheimer and myself made 143 post-mortem examinations of cattle which had died, or were killed while suffering with the Texas fever. In nearly all the same pathological conditions were found which have already been so minutely described and observed by the New York board, with the exception that they were not so aggravated. The sloughs and ulcers in the obomassum or true stomach, were not seen, but patches of abrasion with increased varcularity were frequently found. In the small intestines were observed small yellowish spots or points, of which I have heard no mention made. The glands of peyer and brunner were carefully examined, but no ulceration was found in a single case. In only one animal, to which I shall allude hereafter, was the yellowish-ochre-looking color of the fat, and the mahogany color of the muscles observed. In fact, in nearly all the animals examined, there was no change perceptible to the naked eye in the appearance of the fat and muscles from animals in perfect health. It was soon found, in consequence of the difficulty in detecting the disease in the living animal, unless in very marked cases, and after the removal of the viscera after death, that the only way to make the inspection efficient, and to protect the public health, was to examine the internal organs of all animals slaughtered. In fact, I found it utterly impossible, as a general rule, to decide by the appearance of the carcass, after the viscera had been removed, whether it was fit for market or not. This was especially the case in the early stages of the disease. For instance in a herd of thirty-three that were suspected, only four showed marked signs before being slaughtered, with that increase of temperature which was found to be so infallible a test in diagnosing this plague by the New York board; but upon slaughtering them, I found that the spleen, liver and urine, presented such decided evidences of disease, that I condemned eleven, and was in doubt about five more. The spleens of all that were condemned weighed over four pounds, and bloody urine was found in nine of them. In one of them the spleen weighed eight pounds, but in this case there was no bloody urine. I afterward noticed this fact: that where the enlargement of the spleen was greatest, no bloody urine was found. These cattle were slaughtered two days after the inspection of the viscera at the slaughter-houses was commenced, and I must confess to a keen appreciation of the responsibility resting upon me, in thus imposing so heavy a loss upon the owners, and at the same time discharge my duty in protecting the public health. In the conclusion arrived at, all who saw the affected organs, agreed, and the owners cheerfully acquiesced.

In this connection I would state that the thermometer, although assisting in determining the disease in a suspected animal, was not found in our hands of so much service, while its application to all cases was found impracticable.

Two cases were found where rupture of the spleen had taken place. One of them, examined on September 21st, was particularly noticeable, as about four gallons of bloody serum were found in the cavity of the abdomen, and the bladder was enormously distended, containing nearly three gallons of bloody urine. The spleen weighed ten and one-half pounds. At this time the cases that we saw were more aggravated than usual. The liver was generally enlarged, but not always, and the heaviest liver seen weighed twenty-nine pounds, and in all cases examined fatty degeneration was found. Ecchymosed spots were occasionally met with in the heart, both externally and internally. The condition of the rectum so constantly present in the cases examined in New York, was occasionally seen, and the flaky character of the bile was seen in rare instances. In many of the stomachs of the Texas cattle, cicatrices were seen, proving the existence of disease at some period.

With regard to the transmittal of this disease by native to native cattle, I must confess that notwithstanding the weight of the testimony is against it, I am inclined to believe that such can and does take place. I can see no good reason why such should not be the case.

Mr. Piper, of Illinois—Allow me to ask if you have any evidence that would be conclusive on that point, which you can give the convention?

Dr. Rauch—Several instances of this character fell under my observation during the past three months, but the most conclusive evidence I have is, that native cattle were purchased at Chicago in August, and taken to Lebanon county, Pennsylvania, and that a short time after they died, and that other native cattle on the same farm, and neighborhood, died; and that no Texas cattle had been nearer the place where these animals died, than the railroad, while in transit to New York and Philadelphia, which must be at least three miles distant. My attention was called to these cases by a friend, who wished to know of me whether it would be safe to purchase cattle coming from Chicago, just as I was leaving Lebanon, about five weeks ago. In all other cases that were noticed, the Texas cattle had been near. The assertions that native cattle die of this disease, and do not communicate it to other native cattle; that Texas cattle are perfectly healthy, and still cause a disease that is fatal to native cattle, and that they do not die of this disease, are such anomolies in the history of contagious diseases, that on general principles, I am not disposed to believe it. I must confess that in my opinion there is still much to be learned with regard to this malady. In all cases that came under our observations, where native cattle were not affected, they were stall-fed, and did not graze where Texas or sick native cattle had grazed, which, as far as our experience went, was necessary to transmit this disease.

Almost every imaginable course of treatment was pursued, but it was impossible to tell with what success. At first all the cattle affected died, and it was the general impression that there was not much use in treatment. With this feeling I treated seventeen during the month of September, seven of which recovered. Am not prepared to say that they would not have recovered, had they not been subjected to the course of treatment I put them on. I recollect one case where the animal was bled freely when the first symptom appeared, dying in a very short time after—in fact sooner than any case that came under my observation. I have no doubt but that the free bleeding hastened death, having, on general principles, discountenanced blood-letting before; and the result in this case was strictly in accordance with my views of the nature of this malady.

Carbolic acid, in its different forms, was made use of freely as a disinfectant, particularly at the stock yards, but not as an internal remedy.

THE PRESIDENT—Did the animals that recovered enjoy as perfect health as before they were attacked with the disease?

DR. RAUCH—In some instances they did, convalescing very rapidly, with speedy restoration of the milk in cows.

THE PRESIDENT—They did ultimately arrive at perfect health?

DR. RAUCH—Yes, sir, I saw several of them recently looking very well, and in good health.

DR. TOWNSEND, of Iowa—Just one question, if you please. I believe it is a fact beyond all question, that certain poisonous substances which affect oxen very injuriously, are almost innocuous in the case of cows secreting largely. Is that true of this special poison?

DR. RAUCH—So far as my own observation goes, it was principally among cows secreting milk, and judging from my own experience and what I have been able to learn from other sources, cows were more apt to suffer than oxen, or at least there seemed to be a greater susceptibility to the influence of this poison.

DR. TOWNSEND—The secreting of milk does not exempt them?

DR. RAUCH—No, sir, not at all.

MR. MCMILLAN, of Ohio—I think you stated, sir, that out of seventeen cases, you cured seven?

DR. RAUCH—Yes, sir.

MR. MCMILLEN—Will you be kind enough to tell us how you treated them?

DR. RAUCH—When I first saw them, I gave them large quantities of flax-seed tea, with half an ounce of sweet spirits of nitre three times a day. The next day one drachm of sulphate of quinia, dissolved in a fluid drachm of aromatic sulphuric acid, was given, either twice or three times a day in a pint of water, as I thought was necessary. This treatment was continued until a change for the worse or better was observed. The flax-seed tea was given during the entire time of treatment. I have no doubt that in the early stages of the disease, purgatives that would promote secretion of the bile would be beneficial, but it is exceedingly difficult to pursue a systematic course of treatment, arising mainly from the want of interest taken in the animal by the owner, and the trouble in obtaining correct information with regard to the symptoms, from want of observation. The flax-seed tea and sweet spirits of nitre were given with a view to allay the febrile excitement and promote secretion of urine, which was generally scant and high-colored, even before it became bloody, accompanied by difficulty in voiding. The quinia was given as an antiperiodic and tonic, as in several cases I noticed the disease ushered in with a decided chill, and the fact that the spleen was always enlarged, presenting a feature similar to "ague cake," so common in human beings who had been suffering from the effects of malaria for a long time. The aromatic sulphuric acid was added for the purpose of acting as a solvent of the quinia, a tonic and astringent, and at the same time to cause the destruction of the spores in the blood, and prevent the lowering of its vitality.

The next question to which your attention is called, is whether or not the Texas cattle suffer from this disease? From all of the sources of information within my reach, and particularly from consultation with those in whom I had reason to have confidence, I was informed that they were "perfectly healthy, and exhibit no traces whatever of this disease,'' and such was apparently the case. But I had my doubts, as I could not understand how so wide-spread and fatal a plague could be caused by cattle enjoying perfect health, although I had, up to this time, seen nothing to the contrary. In fact, for a number of days, I was in doubt what course to pursue, owing to the diversity of opinion, prompted more by interest than a desire to arrive at the truth.

We were at first occupied mainly in investigating the disease in the native animals, and preventing the sale of meat from this source. With these doubts, I directed the inspectors to examine the internal organs of the Texas animals, particularly the spleens, and when anything unusual in their appearance was observed, to keep them for my inspection. At this period I devoted much time to the examination of the cattle slaughtered, and while thus engaged, I noticed that the spleens of the Texas cattle were larger, and that the color of nearly all was like castile soap. My attention was called on the 20th of August, at one of the slaughter houses, to four spleens, weighing from four to five pounds, presenting the dark mottled appearance so characteristic of the color of this organ in the native animals that died, and when cut into they presented the same appearance of disorganization. The livers and urine of these animals were also examined, but they presented nothing unusual to the naked eye. Specimens of each were submitted to Dr. Mannheimer for microscopic examination, without telling him from whence they were obtained. After careful examination, he reported that the specimens presented the same structural lesions and changes, but not in so marked a degree as in cattle that had died, and that he supposed they were convalescing—at the same time showing me the specimens under the microscope.

From this time forward all cattle slaughtered were subject to the same scrutiny, and a record of the weights of the spleens was kept. The following table, showing the relative weights of Texas, Cherokee and native cattle, confirmed me in the opinion that nearly all southern cattle were, or had been, more or less affected, and that there is a marked difference in the size and weight of this organ, compared with the native cattle. It will be noticed that none of the Cherokee and Texas spleens weighed less than two pounds, while there was but one of the native spleens that weighed so much. I will also state that nearly all the cattle that were called Cherokee, were in reality Texas cattle, of a smaller size, and younger. This deception was practiced, with the hope of finding a better sale for them, owing to the prejudice existing at this time to Texas cattle.

AUGUST 26TH TO AUGUST 30TH.

Cherokee spleens	2½	2½	2¼	2¼	3	
"	2¼	2½	2¼	2¼	3¼	
"	2¼	2¼	2¼	2¼	2¼	
"	2½	2½	2¼	2¼	2¼	
"	2	2	2½	2½	2½	
"	2½	2	2¼	2	2	
"	2¼	2½	2¼	2½	2	
"	2¼	2	2½	2¼	2½	
"	2½	2¼	2½	2¼	2½	
"	2¼	2½	2½	2½	2	
"	2½	2½	2¼	2¼	2½	
"	2¼	2¼	2½	2½	2	
"	2½	2½	2¼	2½	2½	
"	2¼	2½	2½	2½	2¼	
"	2½	2¼	2¼	2¼	2	
"	2½	2¼	2¼	2¼	2½	
"	2	2¼	2½	2½	2½	
"	2	2½	2¼	3	2	
"	2¼	2½	2¼	3¼	2¼	
"	2	2¼	2½	3		
"	2¼	2½	2½	2½	127	301
"	2½	2½	2½	2¼		
"	2½	2¼	2¼	2½		
"	2¼	2½	2½	2		
"	2½	2½	2½	2½		
"	2½	2¼	2¼	2¼		
"	2¼	2½	2½	2½		
Average					2.37	

Texas spleens	3½	2	2¼	3½	3	3¼	2¼	
"	3¼	2½	3½	3¼	2	2½	2½	
"	3	2¼	3	3	3	2	2½	
"	2½	2½	3¼	3	3¼	2¼	3½	
"	2¼	2½	3½	3	2½	3	3¼	
"	2½	2½	3¼	4	2½	2½	3½	
"	2½	2¼	3	2½	2½	2	3¼	
"	2¼	3	2½	2½	2½	3¼	3½	
"	2½	2½	3½	3½	2¼	3	4	
"	3	2½	3¼	3	3½	2½	2½	
"	3¼	2	3	2½	3¼	2½	3¼	
"	3	2	3½	2½	3½	3	3¼	
"	2½	2¼	3½	2¼	3¼	2½	2½	
"	2½	2	3¼	2½	2½	2	2½	
"	3	3.	2½	3¼	3	2½	3	
"	2	3¼	2¼	2½	3½	2½	2½	
"	2½	3	2½	3	2½	3	2¼	
"	3	2	3	3½	3	3¼	2½	
"	3½	2¼	2½	2½	3¼	3½	3¼	
"	2¼	2	3	2½	3½	4	3½	
"	2	2¼	2¼	2¼	2½	3½	3	
"	2½	3½	2½	2¼	2¼	3¼	2½	
"	2¼	3¼	3	3½	2¼	3½	2¼	
"	2½	3½	2¼	2½	3½	3¼	2½	
"	3	3¼	3½	2½	3½	4	2¼	
"	3¼	3½	2½	3½	2½	3½		
"	2½	3	3	2½	2¼	2½	187	526
Average							2.81	

Native spleens	1½	1	1¼	1½	1¼	
"	1¼	1¼	1½	1½	1½	
"	1½	1½	1¼	1½	1¼	
"	1¼	1½	1½	1¼	1½	
"	1½	1½	1½	1½	1¼	
"	1¼	1½	2	1¼	1¼	
"	1¼	1¼	1½	1½	1½	
"	1½	1¼	1½	1¼	1½	
"	1½	1½	1½	1½	1½	
"	1¼	1½	1¼	1½	1½	
"	1¼	1½	1½	1½	1½	
"	1½	1¼	1¼	1½	1½	
"	1¼	1½	1¼	1¼	1¼	
"	1¼	1½	1½	1½	1½	
"	1¼	1¼	1¼	1¼	1¼	
"	1½	1½	1½	1½	1½	
"	1½	1¼	1¼	1¼	1¼	
"	1½	1½	1½	1¼	1½	
"	1¼	1¼	1½	1½	1¼	
"	1½	1½	1¼	1½	1¼	
"	1¼	1½	1½	1¼	1½	
"	1½	1½	1½	1½	1½	
"	1¼	1¼	1½	1¼	1½	
"	1½	1½	1¼	1½	1½	
"	1¼	1¼	1¼	1¼		
"	1½	1¼	1½	1½	132	184
"	1¼	1½	1¼	1¼		
Average					1.39	

Several days after, my attention was called to an acute case of this disease, well marked, with a spleen weighing eight pounds, of which this is a photograph. The liver was also enlarged, but there was no bloody urine present. In other respects the lesions and changes were the same as in native cattle. Five more cases were found during the month of September, in only one of which, however, was bloody urine found in the bladder. These cases were so well marked that they were condemned, one of them presenting the greenish tinge of the fat, and the mahogany color of the meat, so commonly seen by the New York board. This animal had just arrived from Abilene, and it is but justice to say, that I think that the hardships of the journey had much to do with its condition. With these facts before me, I did not hesitate to announce that the Texas cattle were not in perfect health, and my observations since have confirmed me in this opinion, and they have also been substantiated by others.

After the practice of weighing spleens had been continued for several days, it became apparent that important deductions could be drawn from this mode of investigation, while at the same time the inspection would be conducted more minutely. The weights of the liver was directed to be taken, so that the relation of the two organs, in the same animal, could be settled, and whatever changes, climate, breed, and care of them exercised, could be ascertained. It had already been settled that the spleens of the southern cattle weighed more, and were larger than in native cattle, but, to my astonishment, the conditions with regard to the liver were reversed. As a general rule, it was found that when the animal, native or southern, was in good condition, the spleen weighed less and the liver more than when the opposite was the case. When the animals were well cared for, the spleens were small and the livers large, and in cases where the animals had been transported or driven a great distance, or received but little care, the spleens were much enlarged, with a proportionate decrease in the size of the liver. We weighed them indiscriminately, no distinction being made in the sex at first, but a few of them were separated. I have prepared from the records of the board of health the following table, which gives the weight of 8,403 spleens, and 7,957 livers, of native, Texas and Cherokee cattle:

Cattle.	Month.	No.	Ag. Spleens.	Av. Spleens.	Ag. Livers.	Av. Livers.
Native—Male and female	Aug	93	130	1.40	1,191	12.80
" " "	Aug	132	184	1.39	....	....
" " "	Sept	1246	1846	1.48	16,522	13.26
" " "	Oct	124	163	1.31	1,610	13
" "	Sept	257	373	1.45	2,921	11.36
" "	Oct	167	203	1.21	2,252	13.42
" female	Sept	1444	1997	1.38	17,794	12.32
" "	Oct	1455	1745	1.20	19,506	13.40
Texan—Male and female	Aug	187	526	2.81	....	....
" " "	Sept	252	652	2.58	3,002	11.91
" " "	Oct	29	112	3.86	309	10.65
" "	Sept	669	1464	2.18	8,222	12.29
" "	Oct	1247	2944	2.36	16,045	12.86
" female	Sept	29	70	2.41	360	12.41
Cherokee—Male and female	Aug	10	29	2.90	100	10
" " "	Aug	127	301	2.37	....	....
" " "	Sept	396	922	2.33	4,282	11.32
" " "	Oct	24	89	3.70	254	10.53
" "	Sept	363	580	1.60	3,742	10.31
" female	Sept	152	241	1.58	1,622	10.66
Total No. of spleens 8,403						
" " livers 7,957						

From the time we commenced the inspection of the internal organs to October 25th, we examined 16,800 head of cattle. But few of the animals that were condemned are included in this list. Notes of these cases were taken by myself. It will be noticed that in the month of October, that in twenty-nine cases of Texas cattle slaughtered, the average weight of the spleens was nearly four pounds, while, in the same month, twenty-four Cherokee cattle were killed, when the spleen averaged about three pounds and a quarter. Both these lots of cattle were in a bad condition, and had been transported a great distance.

The weight of the Cherokee cattle was also less than that of native cattle included in this list, so that, for purposes of comparison, the Cherokee spleens may be said to weigh nearly as much as the Texas spleens. Evidences of former disease were found in a great many of the Texas and Cherokee cattle.

Dr. Clendennin, of Ohio—Will the gentleman be kind enough to inform us if these statistics apply strictly to healthy cattle?

Dr. Rauch—Not all of them.

Dr. Clendennin—How are we to distinguish?

Dr. Rauch—As a general rule they do, though a few of them were of cattle positively diseased but these do not make much difference in the total average.

With regard to the microscopical observations made, I would state that, fortunately, Dr. Mannheimer, to whom, in the ordinary routine of duty as sanitary inspector of the fifth ward, the investigation of this disease fell, was a good microscopist, and such was the accuracy of his examinations, made in the first week in August, that subsequent and closer investigation verified them. He had examined the different organs, tissues, blood, bile, urine, and milk, with a microscope of not very great power, when my attention was called, by a letter from Dr. E. Harris, of the New York board of health, to the discovery of a parasite in the blood, bile and urine of diseased native animals, by Dr. Stiles, stating at the same time that a greater power was necessary to see it than that we had made use of. I immediately procured the most powerful instrument in Chicago, and in a very short time the discovery of Dr. Stiles was confirmed.

Our attention was next directed to the blood, bile and urine of Texas cattle, where we also found the spores, but not so abundant as in native animals. The plant was also seen, but not so well defined. I immediately communicated our results to Dr. Harris, and in a very short time our investigations with regard to the Texas cattle were confirmed by them. The investigations of the New York board, in this respect, were conducted with much care and minuteness, as well as everything pertaining to the pathology of this disease.

As no mention has been made of the microscopic appearance of the milk, I would say that the fat cells, or globules, were more abundant than in health. From what I have seen I am satisfied that frost kills the spores.

Dr. Miles, of Michigan—Allow me to ask if any spores were found in the blood of animals apparently healthy?

Dr. Rauch—Not as a general rule, although occasionally we found animals in apparent health, that were really diseased, upon subjecting the organs and fluids to microscopic investigation. In these we found spores, but since the early part of October, no spores or plants were found in any of the animals examined by Dr. Mannheimer.

Dr. Miles—It was only after the external symptoms became severe that they were seen?

Dr. Rauch—Yes, sir; this was the case with the native cattle, but they were also found in the Texas cattle, who were apparently healthy, but not in such great abundance.

Prof. Chadbourne, of Wisconsin—Will you be kind enough to inform us, sir, if you discovered any difference between the plant and the spores of the plant as found in animals?

Dr. Rauch—Yes, sir, the spores were more commonly seen, while occasionally we thought we saw the plant.

Prof. Chadbourne—How did they differ?

Dr. Rauch—The plant was composed of a series of continuous cells or joints, with a number of spores surrounding the tip or end, while the spores were simple dots.

Dr. Townsend, of Iowa—I beg pardon for interrupting you, but I should like to know if you noticed any well-marked disease in the human subject produced by the use of diseased meat?

Dr. Rauch—In reply I would state that special attention was paid to this subject. In a short time after the board of health commenced their investigations, and exercised a surveillance over the stock yards, slaughter houses, and the meats sold for food in the Chicago market, all danger from this source was averted, as no diseased meat was permitted to be sold. In addition to guarding the usual avenues through which the market of Chicago was supplied, all other sources of supply were cut off by means of detectives, so that all beef brought into market was completely under the control of the board. As it was stated that a large quantity of diseased beef had been sold for consumption before this time (which I do not believe was the case), I directed the sanitary inspectors of the different wards to investigate the matter and report to me, with as little delay as possible, whether the consumption of this beef caused any injurious effect upon the health of the city or not. In not a single instance did they report any direct results arising from the consumption of beef, nor did I see or learn of but one case where such was the result. That some diseased beef was sold, prior to this time, is undoubtedly true; but whether it was the cause of diarrhœa, I am not prepared to state, as it was at such a time of the year when diseases of that character prevail, owing to high temperature, etc., and, with us, particularly to the want of drainage in certain parts of the city. If such had been the case, diarrhœa would have suddenly increased, and after the supply of diseased beef was cut off, it would have necessarily diminished; but such was not the fact. Then, again, owing to the general feeling of distrust for a short time, but little beef was consumed; this also caused no perceptible change in diseases of this character.

Dr. Johns, of Illinois—Mr. President, I move that Mr. Brown, of Jacksonville, a brother of the late Captain Brown, whom we all knew by reputation, if not personally, be requested to address the convention, for, though not a member of this body, he has had a great deal of experience in cattle-raising.

The motion prevailed.

MR. BROWN—Mr. President, and gentlemen of the convention, I am happy to be able to state whatever I may know, to gentlemen of intelligence and experience, who seem to be in good faith considering carefully the subject matter before them. The questions submitted to this convention are, in my humble judgment, of great magnitude, appertaining not simply to a few States, but assuming national, international and continental proportions, thereby rendering the responsibility with which you are invested, one of no ordinary character. I will endeavor, gentlemen, to talk plainly, and to the points that seem to me worthy of consideration, in view of the action contemplated by this convention. I am highly gratified that the investigations in regard to the causes, character, and, in short, everything pertaining to this disease, have been carried so far. But, it seems to me that, while these are exceedingly important, the time has come when some proper regulations should be at once adopted, under which the vast cattle interests of this country may be conducted in accordance with suitable sanitary regulations.

To come, then, immediately to the subject matter. The first point to which I wish to call your attention, is this: It seems to be conceded on all hands that this disease is communicated to "home" cattle (and I use that term as embracing all cattle except those brought from Texas) through grazing where Texas cattle have grazed before them. I am just as well satisfied, too, that this disease is communicated as well by cattle that come by the way of Abilene, as by those that come up the Mississippi river, or any other route—when the grounds upon which they have fed are in turn cropped by other cattle—as I am that this convention is now in session before me. I will give you a little of my own experience in handling these cattle; for, though I do not reside upon a farm, I have, whilst a citizen of Illinois, been a greater part of the time concerned in the management of cattle. Early in July last, or about the 1st of June, we purchased at St. Louis two hundred head of cattle, brought from Abilene by Mr. Gregory, of Greene county. They were forwarded, by railroad, to our station, some eight miles south of Jacksonville, and about ninety of them were placed on a couple of farms in that neighborhood, for the purpose of being grazed, as we did not wish them upon the same farms with our native cattle. One hundred and eleven of this same lot I took to a farm which I owned, adjoining Jacksonville, and placed them in an inclosure fronting upon the street, but separated from it by a common rough-and-ready fence. The milch cows of the town grazed right along in front of that tract, and of another lying a little west of me, belonging to Mr. Alexander. Those cattle remained in that pasture about a month, when we removed them to another, on the northern part of the farm, where they were in contiguity with the neighboring cattle on the north, outside of the inclosure; while in the front of the pasture there were a few head of milch cows grazing. After these two pastures had been exhausted, we rented of Mr. Alexander a strip of ground, fronting on a street running on the west side of his land; which land, in turn, fronted upon the same street in which I grazed the cattle in the first instance. Those cattle all remained healthy, although thus exposed to the public roads adjoining the city of Jacksonville, where foreign cows were continually passing along. The same is true of the cattle grazed eight or ten miles below Jacksonville. These facts, connected with innumerable others, together with those reports submitted by Dr. Johns and my brother, go to show that it is (I will not say impossible) not at all probable that the cattle inside of an inclosure will communicate this disease to those outside. Though an extremely rare case may happen to the contrary, it seems to me that for the purpose of our ordinary business transactions, we may regard that proposition as true.

I believe that I will so far trespass upon your patience as to read to you, upon this subject, a portion of a letter written by a gentleman in Missouri, who has had a great deal of experience regarding this particular point. It is as follows: "Without troubling you with details, I will first state to you the conclusions to which I have arrived. First, and most important, how is the disease communicated? Beyond a doubt, from contact; or rather from feeding or watering with or after Texas cattle, as I have never yet known a case that could not be traced directly to those causes; nor have I known a case in which the disease was communicated when a fence intervened between the healthy and affected stock. I have had my own cattle separated from large herds of Texas cattle only by a fence, without any evil results. And of the immense number that have died on this road, none have died on pastures from which Texas cattle have been excluded, The instances to substantiate this view are so numerous, that I will not undertake to enumerate them. My own opinion is, that the poison is taken from the stomach," etc. Then he goes on to state his theory about the disease. That is what Mr. Chisholm has to say about the matter. I have not had a case, myself, since adopting this plan, though tens of thousands of Texas cattle have passed my door.

If it be true, gentlemen, that cattle thus isolated in this simple manner do not communicate the disease, what next? Is this disease communicated by bringing these upon the railroad? On the cars that run from Kansas City to Quincy and Alexandria, home cattle were transported in them one day, and Texas cattle the next, if the car got back so quick. If I am correctly informed (and I confidently believe I am), not a single home steer has been contaminated by being transported in that manner. I believe I am warranted in saying this is true. And if it be, bearing in mind the fact that thousands and thousands of cattle have been shipped over this road this season, where is the danger of shipping Abilene cattle into Illinois, or any other portion of this great northwest? And when they have grazed upon our pastures, and fattened upon our corn, where is the danger of taking them to New York and feeding the poor of that city upon them? If Texas cattle are excluded from that market, then the lower classes must do without their beef, because the price of it will be so enormous that the poor man cannot afford to buy it. Therefore, this question is not one simply of interest to the farmers of the west, and to the people of Texas, with their millions of cattle, but involves, as well, the sustenance of the working classes of the eastern and northern cities, who as much deserve the consideration of this convention as those who can eat beef irrespective of the price.

Allow me to allude to another point just here, for fear I may forget it. Is it true that there is any danger of domiciling this cattle disease in Illinois, or any part of our northern country, through these spores? Is there any danger? If there be, we, who live in Illinois, are most deeply and vitally interested, and it behooves us to be on the alert, lest we be involved in it. I imagine, however, that this theory is not practically true, and I will present one or two reasons why it seems to me that it is not.

In the first place, for twenty years, except during the war, I have been, to a greater or less extent, handling these Texas cattle in Illinois. Is there any man who, during that time, has ever known of the cattle disease being communicated to a single animal in the spring following the summer and fall, during which Texas cattle have been grazed upon those lands? I don't believe that a single man can be found who will even intimate that.

Again, in regard to a paper read this morning by the gentleman from Missouri (Mr. Smith), and, also, with regard to a conversation which I had, the other day, with a representative from the southwestern part of that state (Mr. Moore). It was stated both in that paper and by the gentleman, as I understood, that during the war there was no Texas cattle fever in southwest Missouri. I believe the gentleman, also, concurred in the belief, that after winter had intervened there was no danger.

Mr. Moore, of Missouri—I beg your pardon, sir; that is not my opinion. All the information that I have upon that subject goes to show that the winter does not kill the disease.

Mr. Brown—I am glad to be corrected, sir. If I understood the report read this morning, it stated that during the war (which occupied at least four years) there was no Texas cattle fever in southwest Missouri, for the reason that no Texas cattle were brought there.

Now, if this disease can be communicated in the manner stated by the theory I have just alluded to, would it not have been likely to have appeared? Will the gentleman be kind enough to state how it is, that if the disease may be propagated as he supposes, it was not, in fact, disseminated during those four years of war.

Now, gentlemen, it seems to me that, taking all these points together, we have information enough to enable us to adopt some simple, just and equitable measures, easy to be understood and easy to be enforced, in relation to this disease. Suppose that during the months in which this disease is liable to be communicated (giving the widest margin), Texas cattle be excluded—say from the last of March to the first of October, until the frost comes—then permitting them to come in—holding every man responsible for any damage that may result from the infraction of the law into which this measure is proposed to be enacted.

The President—I would like to ask you, sir, if killing frosts occur in this section until about the first of November?

Mr. Brown—I am not very familiar with that subject, Mr. President; but I believe that, although some seasons are warmer than others, the weather is by that time sufficiently cool to, with proper safeguards and restrictions, allow of these cattle being brought in.

Two or three other brief remarks, gentlemen, and I am done. As was remarked by the gentleman from Kansas (Mr. McCoy), yesterday, Texas is an immense empire, capable of being divided into four states, as provided, whenever the proper time shall come. It contains millions of cattle, which, with proper regulations, can be brought into Kansas, Nebraska, Iowa, Missouri, Illinois, and other sections of the country, and consume the grass and corn which otherwise would be comparatively worthless. Unless they can be allowed to do that, we shall be simply doing a small business in home cattle, that will hardly afford our farmers a decent rent for the lands upon which the cattle are grazed. There are exceedingly few, right here in the center of this great cattle region, who have gained a fair compensation for their grass and corn simply by handling home cattle; and I venture to say that this very year, some of the most careful men in Morgan county will lose money in carrying on that business, for the simple reason that I have stated.

DR. CORSON, of Pennsylvania—Will the gentleman be kind enough to explain, Mr. President, why prices should be so low that no money can be made if Texas cattle should be excluded?

MR. BROWN—Prices of home cattle will be higher if you exclude Texas cattle.

DR. CORSON—I understood you to say that farmers could not raise home cattle enough to consume the grass and corn.

MR. BROWN—They would be able to do so in a limited way, but the revenue would be proporably lost, unless they could realize what I suppose they could not—famine prices.

DR. CORSON—Would it not be rather because they could not send the necessary number?

MR. BROWN—Precisely—they could not raise them.

MR. EARL, of Indiana—Are not these your views, sir: that it would be impossible for the farmers of the west to raise calves and send them forward as stock, so as to make it profitable?

MR. BROWN—Precisely.

One word more. I believe it is conceded that when these Texas cattle leave our western farms —go to the eastern markets and are slaughtered—they make good, wholesome food.

And if that be so, why is it, I ask, in the name of reason, common sense and humanity, that they are to be excluded? The good God made them for some wise purpose. He did not constitute that vast domain, so admirably adapted to the raising of cattle, that they might merely reproduce themselves, and die, generation after generation. He made them for the use of man; and now, when we may safely make use of these animals to the great benefit of the western people, through the consumption of their grass and grain, and benefit just as much the eastern people by giving them good healthy beef, at prices which they can afford to pay—how can any one argue that this great traffic should not be allowed to go on, under suitable restrictions?

MR. POOLE, of Indiana—Mr. President, I wish to make one remark, not only in justice to myself, but to the state board of Indiana, the people of that state, and to its governor, who kindly sent me a letter requesting me to come here.

I am here as one of the commissioners of that state. I had no intention of saying one word that was not true, and have made no statement here that is not a fact. That being the case, I do not feel as though I had been treated exactly right when gentlemen rise here with positive assertions and statements, and undertake to show distinctly that what they say is so, and that what I have said is false.

Now, sir, I stated yesterday that this disease had been contracted by cattle that were never outside of a field that Texas cattle had never been inside of. And I stand here ready to substantiate that testimony by the evidence of as good men as there are in Indiana or Illinois—of the men, themselves, who owned the cattle, who will swear, positively, that what I stated was true.

MR. BROWN—One word, if you please, Mr. President. I did not intend to question the truthfulness of the gentleman's statement; but as I recollect it, it was extremely doubtful whether the disease was, or was not the result of communication between the cattle. I positively disclaim all intention of discourtesy.

MR. CHRISTIE, of Canada—Mr. President, the matter in regard to which this little conversation has just taken place, is a very important one; and for the sake of clearing it up beyond all controversy, I wish to refer to a fact which came under the observation of the Canadian commissioners, and which occurred in this state during the month of August last.

In the Illinois correspondence of the *Country Gentleman*, date of 13th of August, it is stated: "In the town of Tolono lives a Mr. Lawrence, a very pains-taking and hard working man. His cows are fenced within his lot, and this is watered from a well three times a day. His cows were divided from the open prarie and the Texas and native cattle by a common board fence only; yet he has neither lost an animal, nor have they been in any way affected."

I will now read to the convention Mr. Larmon's own statement, premising, by the way, that on visiting Tolono, there was not, and never had been a man there by the name of Lawrence, and that the name of the gentleman in question was Isaac Larmon. His narrative, under his own signature, is as follows: "My two cows have been grazing in an inclosure adjoining the prairie where the southern cattle graze, only separated from them by a common board fence. I attended to my cattle regularly, three times a day, until about ten days ago. I supposed them exempt from the disease. About that time, one of them showed symptoms of illness, and died after three days' sickness. The other became sick; and it is my opinion that she is in the last stage of the disease.

I am of the opinion that my cows got the infection from the Texas cattle. I have seen the Texas cattle dying in great numbers, apparently of the same disease, having the same symptoms.

There is no one in the town of Tolono, within my knowledge, of the name of Lawrence, as mentioned by 'B. F. G.' in the *Country Gentleman.*"

I may state that when we called upon Mr. Larmon, he told us he left the last of his cows for dead that morning, and that she was then lying in the ditch. We found her there, still alive, and dragged her out by means of some ropes. She was able to get on her feet, but was in a very weak condition, being in the last stages of the disease, and died the next day.

Here, then, is a case, beyond all controversy—the very case which has been referred to as positive proof that cattle could not contract the disease when protected by a common board fence—establishing the fact that such protection is not sufficient.

Dr. **Clendennin**, of Ohio—Mr. President, I have heard with a great deal of pleasure the results of microscopic examinations which have been detailed to us by several members, which I believe to be extremely important to the correct understanding of the nature of this disease. In relation to them I wish to make one remark.

There seems to be one link, at least, wanting in the chain of evidences with reference to these spores, and that is what produces this disease in cattle in Texas, and to what extent does it there prevail?

If I understand correctly the statement of the gentleman from New York, (Dr. Morris,) these spores originate among the native grasses of Texas, are brought hither by the Texas cattle, and by them disseminated. Now, if that be so, then comes this question: is the disease much more prevalent there than it is here? The ascertaining of that fact is, it seems to me, the starting point.

In reference to this doctrine of spores producing disease, we have conflicting opinions. In the early part of the war, measles were generally very prevalent throughout the army. One medical gentleman attributed the disease to a particular kind of a spore or cryptogamous plant, which was always found, he said, in straw. But it is well known to all of us that straw was very rarely found in the front, where measles prevailed to a very considerable extent.

Professor Mitchell, of Philadelphia, published as early as 1846, I think, a little book, in which he claimed that we had, in this doctrine of spores, an explanation of causes of the potato rot, cholera, yellow fever, intermittent and remittent fever. There certainly are some points connected with the statements made to-day, with relation to the development of these spores, which, it seems to me, are not fully elaborated, but what I wish to know just now is, whether there is any gentleman present who can give us any information regarding the prevalence of this disease in Texas,

Mr. Piper, of Illinois—Mr. President, a notice has been handed to me by a gentleman largely interested in cattle raising in this county, and which I wish to read to the convention. There is a gentleman present who can explain it.

It is as follows: "I understand that E. R. Ulrich and Wilson, wintered some Texas cattle in Kansas last winter; that some of them were kept on hand until summer, and communicated the disease to other cattle."

Mr. Ulrich is in the house, I see, and can tell us whether that is the fact.

I would suggest, Mr. President, as no invitation has been given to cattle dealers generally (and there are very many of large experience who are attending our deliberations, and are much interested therein), to give us their views on this subject of Texas cattle, they be respectfuly requested to do so.

The motion prevailed.

Mr. Howard, of Michigan—Mr. President, there are one or two doubtful points, in the subject under consideration, so very important that it seems to me they should be more fully elucidated than they have yet been. One of these is: whether it is possible that the disease may continue through the winter and be propagated the following season—and in regard to that, some gentlemen have stated that they could give us information.

It seems to me that we had better use as much method as possible, and first clear up these doubtful points—especially those in regard to the source of the disease, and whether it can be continued through and propagated after a winter.

Mr. Barrett, of Missouri—It seems to me, Mr. President, that we have consumed a good deal of time in speech-making, which has elucidated comparatively few facts, and in order that members may feel the necessity of expressing themselves briefly, and to the point, I offer the following resolution:

Resolved,. That members of this convention and others who may be invited to address us, shall not consume more than ten minutes at a time, in the discussion of any subject.

The resolution prevailed.

Mr. Piper, of Illinois—I move, Mr. President, Mr. Ulrich be invited to give us an explanation of the note which I have just read.

The motion prevailed.

Mr. Ulrich—I accept your invitation, Mr. President, and the explanation is as follow: We sent to Kansas two shipments of blooded cattle from this county (perhaps in all fifty or sixty head), the first lot being shipped last winter, and the last some time in May, I think, of this season.

Mr. Wilson, in November last, I think, bought there six Texas cows, who ran on the prairie with these native cattle. Besides that, I had a herd of some three hundred cattle, that once in a while would get on the same ground with these cows.

In July, Mr. Wilson wrote me that one or two of these blooded cows, sent out in May, had died, and that one or two more were sick. He is here himself, I believe, and can state exactly the number of cows we lost, but I don't think there were more than four out of the whole fifty or sixty, and none of my native steers running there died at all.

I cannot entertain the idea that these six Texas cattle were responsible for those deaths. That is more than I am able to understand, because if they gave the disease to part, why should they not to all? It seems to me, that these three, four or five cows, having just been shipped out there, very likely died while undergoing acclimation, for if the Texas cattle communicated the disease to them, it does seem as if they must have communicated it to hundreds of others with whom they came in contact.

Mr. Christie, of Canada—Allow me to ask you, sir, in what part of Kansas did this occur.

Mr. Ulrich—Twelve miles northeast of Topeka, sir.

Dr. Morris, of New York—Mr. President, in explanation of the remark of the gentleman from Ohio (Mr. Clendennin), I would simply remark that it is a well-known fact among botanists, that this microscopic cryptogam does grow upon bottom lands in warm latitudes.

Another point that I omitted to mention is: that these spores are found only in the blood of Texas animals, either sick or well, or in the blood of sick native animals. They never yet have been found in the blood of healthy native animals.

The President—With your permission, gentlemen, I will call upon Mr. Hill, of Illinois, to give us some information on this subject.

[Certainly, certainly, let us hear from him.]

Mr. Hill—Mr. President and gentlemen of the convention, the citizens of our township (Tolono), who have been the greatest sufferers in the state of Illinois, have sent me here to make a representation of their case, if permitted to do so, and to intreat you that your measures might so be shaped as to grant us, if not relief for the past, yet security for the future.

Our little town is situated, as you are aware, at the crossing of the Great Western, and the Chicago branch of the Illinois Central. Great preparations were made there last spring by the Illinois Central railroad, and many thousand dollars expended in building fine cattle pens and barns, which, although the road denied it, we supposed were intended (as the fact turned out to be) for the purpose of facilitating the importation of these Texas cattle. The first train containing any arrived on the 29th of last April, and they continued to come until late in the summer. About the 10th of June, the cattle disease broke out and continued to rage as long as there was material for it to work upon, until nearly all of our cattle fell a prey to it. Among the few left, the disease still continues to work, one gentleman having lost some five steers only last week. On the 5th day of September, within two miles of the town, I think there were but two milch cows left, and up to that time seven hundred and seventy-six cattle had died in that little township, which polls but a trifle over two hundred votes, since which time two hundred more have died.

Some facts have been stated in regard to Mr. Larmon's cattle, and the disease not being communicated to them across the fence. As I am a near neighbor of his, I will just state what I know about that. His cows were among the last that died, but they did die, notwithstanding that they were inclosed, I think, by a common five-plank fence.

Our loss has not only been very great, but has borne very hardly upon us, as a large portion of our population consists of foreigners, who have kept one, two and three cows, the milk and butter of which constituted the chief support their families. Having lost their stock, they are unable to buy any more.

The gentleman (Mr. Brown), argued very strongly, a few moments ago, in favor of bringing in and raising Texas cattle here, for the reason, as he asserted, that there is no profit in raising home cattle. I would like to know if the cattle raisers of this country did not make money before Texas cattle were imported. They certainly did, and most of them got rich upon the profits of native cattle raising; and so it would be now, if these Texas cattle were not brought in. Many a small farmer has purchased his farm, expecting to pay for it by raising home cattle. We have many such instances in our country, where men had fifty, sixty or seventy head of cattle, which they expected to sell this fall, and thereby pay for their places. But having lost their stock, their farms must go, and they themselves be reduced to poverty.

Not only have our cattle been thus destroyd, but our horses are now dying from the same disease, a number having died this last week with precisely the same symptoms, in every respect, as those of the Texas cattle fever. We are, sir, now deprived of our cattle, and if our horses are taken away, what must become of our country? It must return to its native wildness, and become a wilderness. You can hardly find a man in Tolono who is not desirous of selling his farm and leaving that section. A great many have sold out, many others say they will be obliged to if these cattle are still brought in as they have been; and thus the whole of that portion of the state may become depopulated.

The argument in favor of importing these Texas cattle, in order that certain parties may profit thereby, reminds me very strongly of the old fable of the boy and the frogs. It is all very nice, as far as they are concerned, for a few cattle dealers to flood the country with these Texas cattle, and enrich themselves, but it is death to the inhabitants, who not only have lost their cattle, but who must pay taxes on them notwithstanding, that is, they must, according to law; but our people are not able to do that, and the taxes cannot be collected. The farmers of our section are driven to desperation, and I will say to the gentlemen here who argue in favor of bringing in Texas cattle as a means of cheapening beef, that if anybody brings any more Texas cattle into our region, their meat will be very cheap there, just as sure as you are born. This is the state of feeling there, and has been for the last three months. It has been all that the conservative and law-abiding citizens could do to prevent the tearing up of the railroad and the killing of the cattle brought there, and if more is sent, it will be impossible to any longer restrain mob law, much as that is to be deprecated.

Great as is the necessity of supplying the New York market, we must look at what we are to do at home. I ask this honorable convention whether the people would rather do without Texas beef or without milk and butter, for you must dispense either with the Texas cattle, or with those staples. We have not had any milk in Tolono, that is, none to speak of, since last July, and where butter used to be ten and twelve cents a pound, it is now forty-five and fifty, it being impossible, half of the time, to get any for love or money.

THE PRESIDENT—The gentleman's time is up. Will the convention extend it?

[Certainly, certainly.]

MR. HILL—Thank you, Mr. President and gentlemen. As regards the argument that these Texas cattle should be brought in, in order that certain men may reap the profit, and that eastern markets may be supplied with cheap beef, it seems to me that for the same reason you might as well break down the manufacturing interest of the United States in order that England may flood us with cheap goods, and that importers may grow rich thereby.

MR. GOULD, of New York—If the gentleman will pardon the interruption, I should like to ask him how many milch cows are now left in Tolono?

MR. HILL—Only two.

MR. GOULD—Be good enough to tell us how many you had before the disease appeared.

MR. HILL—I should think at least four hundred and fifty, sir.

MR. GOULD—Has there ever been any examination made of those horses which are said to have died of Spanish fever, and if not, please state what the external symptoms were.

MR. HILL—I don't think there has been any scientific examination, sir. The external symptoms were drooping of the head, roughness of the coat, rounding up of the back, and weakness across the loins; finally, the animal sinks down and dies.

MR. GOULD—Did you observe any bloody water?

MR. HILL—I never examined that, but there is a yellow mucus exuding from the nose and mouth, accompanied by drooling, as in the cattle disease.

MR. GOULD—Are there frothy air-bubbles in the mucus of the mouth?

MR. HILL—Yes, sir.

MR. GOULD—No bloody water has ever been generally observed?

MR. HILL—I think not.

MR. GOULD—What is the condition of the stools?

MR. HILL—Dry and hard.

MR. GOULD—Is that invariably so?

MR. HILL—I think it is; nearly so.

MR. GOULD—Have you ever observed anything with regard to the odor of the sick animal and the healthy?

MR. HILL—There is a very noisome smell of both. A day or two before they die there is a moisture, almost like grease, on the tongue, which smells very badly.

Mr. Gould—Has there ever been any attempt to measure the temperature of the animal when sick?

Mr. Hill—I think not, sir.

Mr. Gould—How many horses have died, as near as you can recollect?

Mr. Hill—I think, seven or eight at first, and four or five since; some of which have died within the last two or three weeks, and some four weeks ago. Several horses died earlier than that; but not thinking that this disease would affect the horses, no particular attention was paid to that at the time.

Mr. Gould—Did these sick horses have any peculiar expression of the eye?

Mr. Hill—Yes, sir; the same expression that cattle have, as near as a horse can look like a creature.

Mr. Gould—Have any mules died with this disease, sir?

Mr. Hill—There are considerable many employed about there, but I don't think that there have—never heard of any. I can give you the names of those who have lost horses, and you can communicate with them.

Dr. Kile, of Illinois—You stated, I think, sir, that cases had occurred where Texas cattle outside of a fence had communicated the disease to cattle within the inclosure?

Mr. Hill—I only know certainly of one case. I would not hazard an assertion, but I think other cases have occurred.

Mr. Thayer, of Massachusetts—I understood you to say, sir, I believe, in relation to the discharges from the nose and mouth, that they were both of a yellowish color?

Mr. Hill—Yes, sir.

Mr. Thayer—Alike from both?

Mr. Hill—Yes, sir.

Mr. Thayer—How was the respiration—hot?

Mr. Hill—Hot and difficult—just before death.

Mr. Thayer—How was it in the first stages; or rather I will ask you, how long did the disease continue before death ensued?

Mr. Hill—They died in not more than from three to four days after we discovered that they were diseased.

Mr. Thayer—One more question, if you please. Do you know whether the horses lay down any during the sickness?

Mr. Hill—I cannot answer.

Mr. Gould, of New York—Was there any cough, sir?

Mr. Hill—No, sir; none more than natural. It was nothing like the cough of a horse afflicted with the horse-distemper, or anything of that kind.

Mr. Stockdale, of Ohio—Allow me to ask you, sir, if any young calves still sucking died?

Mr. Hill—Yes, sir; considerable many calves died, but not nearly so many of them as of the old creatures. A good many sucking calves did die; but sometimes the cow would die and the calf would suck until death and yet not die.

Mr. Poole, of Indiana—Let me trouble you with one question, sir. Might not those calves have died from want of nourishment and care, whether there was any disease or not?

Mr. Hill—I don't think that was the case, sir; for there was so much good feed that a calf a month or six weeks old could have subsisted very well. There might have been, and probably were some very young ones that died from these causes; but some of them presented all the symptoms, and undoubtedly died of this disease.

Mr. Gould, of New York—Can you tell us, sir, whether the animals who imported the disease came from Texas by way of the river, or from Abilene?

Mr. Hill—They came on the railroad from Cairo, and I should suppose by boat from the Red River to that place. Mr. Eaton can answer the question.

Mr. Gould—Will Mr. Eaton be kind enough to answer that question?

Mr. Eaton—My impression is that all of the cattle unloaded at Tolono came by way of the river; at least I am not aware that any came by way of Abilene.

Dr. Rauch, of Illinois—Will you be kind enough to tell us, Mr. Hill, if any cows have died recently in the neighborhood of Tolono?

Mr. Hill—Yes, sir, some have; after our cows had all died out some eight or ten were brought from Edgar county, I think. It was stated that they had never been exposed to the Texas cattle ranges, excepting as it was necessary for them to cross where Texas cattle had been driven. They were sold in our place, and part of them have died.

The President—Were those native cattle, sir?

Mr. Hill—Yes, sir, brought there four or five weeks ago.

Dr. Rauch, of Illinois—How soon did they die, sir, after being brought to your place?

Mr. Hill—In about three weeks. They were brought there four or five weeks since, and some of them died ten days ago. Cattle are dying there yet. One gentleman lost seventy previous to the 15th of November, and when the disease broke out again last week he lost three fine steers of those few that were left over from the first.

Dr. Rauch—Had there been any frost at Tolono?

Mr. Hill—Yes, sir; both frost and snow.

Dr. Rauch—It is certain that the animals were not exposed to the influence of the Texas cattle before being brought there?

Mr. Hill—I am only able to state on the responsibility of the gentleman who brought them there.

Mr. Earl, of Indiana—Allow me to ask you, sir, if there have been any late importations of Texas cattle, say since September, that may have imparted this disease, or was it caused by the cattle that came in in June or July?

Mr. Hill—It was from cattle that came in in June and July.

Mr. Christie, of Canada—Another question, if you please, Mr. Hill. You say that some steers have recently died?

Mr. Hill—Yes, sir; and a number from an importations of native cattle.

Mr. Christie—Were those steers at Tolono during the season, or have they been imported since?

Mr. Hill—They were near Tolono, on a farm, all the summer, sir. Seventy died previous to the 15th of September; eight or ten of the same head escaped then, three of which died last week.

Mr. Christie—Then they were in contact with the diseased native cattle of the same herd?

Mr. Hill—Yes, sir; and of the ground on which Texas cattle had died.

Mr. Christie—That shows the second period of incubation.

Dr. Miles, of Michigan—I should like to know the facts, Mr. President, in regard to the communication of this disease after the winter has elapsed. The gentleman from Missouri (Mr. Moore) can enlighten us, I believe.

Mr. Moore, of Missouri—What I have to state, Mr. President and gentlemen, in relation to the question is simply this. Some freighters about to cross the plains selected native and Texas cattle, herded them and fed them together during the winter, made up their teams in the spring, and started across the plains with all their animals apparently well. When they had got half way across the plains, the native cattle were all dead, and the Texas cattle were left to make the journey alone. Those are the facts as communicated to me by a gentleman who was with the train and knew all about it.

Dr. Miles, of Michigan—Were these animals obliged to pass over the trail of Texas cattle, do you know sir?

Mr. Moore—There were no trains, except oxen, going that way—that is all I know in that particular. I am perfectly familiar with the Spanish fever among horses, as I have had many afflicted with it while in Texas. The horses have it more there than the cattle, and they are not considered of hardly any value after having been troubled with it—and they seldom do recover so as to be of any use.

Dr. Corson, of Pennsylvania—Will you be kind enough to tell us, sir, whether the Texas cattle have the fever in Texas. A gentleman informed me yesterday that they did not.

Mr. Moore—I very seldom saw a case there, sir, among them, and I resided there six years, though I have seen very many horses have it there.

Dr. Thayer, of Massachusetts—I should like to ask you sir, whether the symptoms of the disease called Spanish fever, among horses in Texas, are the same as the symptoms of that fever, so called, among cattle in Missouri?

Mr. Moore—Yes, sir; it is looked upon as the same thing, and I think they are the same exactly.

Mr. Barrett, of Missouri—Mr. President and gentlemen, in 1866 I started from St. Louis to go to Texas. Having but a short time to make the trip, I selected what I thought was the best horse I ever saw—I think I averaged forty-five to fifty miles a day. On getting about to the southwestern part of Missouri, I found the corn worm-eaten, and little or no hay, so that I was compelled to graze him in the daytime. The morning following my arriving in Texas my horse was taken sick, with very much the same symptoms that have been described here as belonging to the Texas cattle fever, and was told there that my horse had it.

I offer this information in corroboration of the fact that horses do die of that fever when taken to that country.

Mr. McCoy, of Kansas—Mr. President, when the first reports reached us at the west regarding cattle dying of Spanish fever in Illinois, there were then at Abilene between thirty-five and forty thousand cattle, and probably some six hundred persons attending upon them. I made it a point to inquire diligently among all these drovers, cattle-holders, etc., who were perfectly familiar with the whole subject, whether in the state of Texas they had anything like the Spanish fever among the cattle there. And I state as matter of fact to this convention, that I never yet found one single man who had ever seen or heard in that state of one case of Spanish fever among the cattle; but they all said it was frequent among the horses. Futhermore, that a horse was worthless after having had it—of no account at all.

It has occurred to me repeatedly, during the session of this convention, that we should ascertain beyond all question whether or not this disease does exist among cattle in Texas; and should also find out, beyond all possiblity of doubt, what are the roots or seeds of this disease. It seems to me that there is where we must commence our investigations in order to arrive at a correct conclusion. We have not yet been able to ascertain, to our own satisfaction, the point from which it originates. The furtherest southwest that we can trace it, is southwestern Missouri and southern Kansas; for I have, at least, yet to hear of a case in the Indian country.

Mr. Barrett, of Missouri—Did you ever hear, sir, of a case of our native cattle being taken from the states to Texas, and there dying of the Texas fever?

Mr. McCoy—Well, sir, I have made some inquiries upon that subject, of drovers bringing cattle from the central and southern part of Texas, why they did not come north and procure the means of improving their stock, and make it as good as the stock in northern Texas. Many of them would state that their stock was so near worthless—there being no market—that it would not pay for them to take that trouble. Others would say that such and such a one had tried that, but the imported animals had died. But Durham stock has been successfully taken from this state, and have very much improved the native stock of the northwestern portion of Texas, so that to-day, cattle coming from the north or northwestern portion of that state are as radically different in appearance from those of the lower counties, as the improved Durham is from the Southdown. The difference is so marked that whenever a drove of Texas cattle arrive in any market, well posted men can readily tell what section of the country it comes from.

Mr. Barrett, of Missouri—Will you be kind enough, sir, to answer my question a little more fully?

Mr. McCoy—I stated, sir, that the native cattle taken into the southern and central portion of Texas, for the purpose of improving the stock, died as I am told. Whether they died of this cattle disease, or in consequence of being transported there, I am unable to say; but I do say that into the northern portion of Texas the importation of Durham stock has been so successful as to radically change the cattle of that section of the country.

Dr. Clendennin, of Ohio—I wish, Mr. President, to make one statement.. It may not be known to some members of the convention, that in the agricultural report issued from Washington in 1868, there is a very full history of attempts made to propagate in Texas, cattle from the northwestern states.

Dr. Johns, of Illinois—I move, Mr. President, that the convention will now adjourn to half past seven o'clock this evening.

The motion prevailed.

EVENING SESSION.

The convention met pursuant to adjournment.

Mr. Gould, of New York—Mr. President, I have the honor to submit the following report from the committee appointed at a preceding session, for the purpose of drafting certain propositions relative to this cattle disease, which might be enacted into laws by the legislatures of the respective states:

The covention of American Cattle Commissioners, assembled at Springfield, Illinois, respectfully recommend to the several states represented therein, to give effect by legal enactments to the following general propositions which are believed by the convention, to embody principles which are of the greatest importance; not only for the welfare of the cattle interests, but for the security of the people themselves.

I. COMMISSIONERS AND ASSISTANT COMMISSIONERS.

1. Three commissioners, or such other number as the legislature shall deem proper, shall be appointed by some competent authority, to hold their offices for five years, and shall report annually to the legislature.

2. Such commissioners shall watch over the general welfare of cattle within the state for which they are appointed, and particularly for the purpose of preventing the spread of dangerous diseases among them, and of protecting the people of the state against the danger arising from the consumption of diseased meat.

3. They may from time to time appoint such assistant commissioners, to aid them in the discharge of these duties, as the welfare of the public may require.

4. They should have the power to administer oath, and to prescribe from time to time such rules and regulations as may be necessary to accomplish the objects of their appointment.

5. They shall give public notice of the outbreak of any dangerous disease, and such practical directions for its avoidance as they may deem necessary.

6. They may either place such diseased animals in quarantine, or cause them to be killed, as may seem necessary for the public protection; but in the latter case, they shall cause an appraisal of such animals to be made, and the county or state shall pay such proportion of the appraised value as may be provided by law.

II. RAILROAD.

1. The commissioners, or any assistant commissioners located on the frontier of the state, shall, at such time as may be prescribed by the commissioners, have power to inspect all the cattle brought into such state, whether by railroad, vessels and common roads; and shall have power to detain such railroad cars, vessels, and droves or animals on common roads, long enough to make a proper inspection of them for the purpose of ascertaining their sanitary condition.

2. No animal shall be permitted to enter the state, which shall be deemed by such assistant commissioners to be capable of diffusing dangerous diseases, or if injuring the health of the inhabitants.

3. No train shall be allowed to proceed, unless the animals contained therein have been supplied with food, water and rest, within twenty-four hours next preceding the time of such inspection.

4. All animals shall rest and have access to food and water for twenty-four hours after having traveled for a similar period.

5. The railroad companies shall provide suitable yards for feeding, watering, and resting the animals traveling on the train, and for quarantine purposes, which shall be kept in a cleanly and wholesome condition, to the satisfaction of the commissioners.

6. Each train, on leaving its point of departure, shall have a certificate, signed by an assistant commissioner, which shall certify that all the animals therein were in a healthy condition at the time of its departure, and also, the exact time of its leaving; and such certificates and indorsements thereon of the time of resting and the time of departure of the train, at subsequent resting and feeding places, shall be exhibited to the proper authority whenever required.

7. Proper penalties should be inserted to prevent the bribing of officers charged with the execution of these provisions.

8. Proper penalties should also be provided for those who interfere with, or resist the officers charged with the execution of these provisions.

III. PREAMBLE AND RESOLUTIONS.

WHEREAS, A malignant disease among cattle, known as Spanish Fever, has been widely disseminated by the transit of Texas and other southern cattle through the western and northwestern states, during the warm season of the year, occasioning great loss to our farmers, and possibly endangering the health of our citizens therein.

Resolved, That this convention earnestly recommend the enactment of stringent laws to prevent the transit through these states of Texan or Cherokee cattle, from the first day of April to the last day of October, inclusive.

Resolved, That the interests of the community require the enactment of laws making any person responsible for all damages that may result from the diffusion of any dangerous disease from animals in his ownership or possession.

All of which is respectfully submitted.

I would like, Mr. President, and gentlemen, to say this much in explanation of the report: it was utterly impossible to make it in the form of specific enactments, for the reason that the local governments of the different states vary to so great an extent.

For example, the state of Rhode Island has no county government whatever, and duties imposed by law on county officers would find no officers there to fulfill them; and so, in various other ways, it is found that the different constitutions of the states prevented any uniform enactment. The committee, therefore, decided to present their report in the form of general propositions, to be submitted to the various legislatures, to be reduced to form by those legislatures, in accordance with their respective powers.

Mr. Piper, of Illinois—I move, Mr. President, that the report be received.

The motion prevailed.

Dr. Morse, of Missouri—Mr. President, for the purpose of giving all, who may desire, an opportunity of saying something on these propositions, I offer the following resolution, and move its adoption:

Resolved, That in the discussion of this report, members be limited in their speeches to five minutes time, unless, by consent of the convention, that time is extended.

Mr. Hamilton, of Pennsylvania—I move, sir, to amend by striking out "five," before minutes, and inserting "ten."

Dr. Morse—I accept that amendment, Mr. President, and renew my motion.

The motion prevailed.

Mr. Poole, of Indiana—I move, Mr. President, that we take up the propositions offered by the committee, *seriatim*.

The motion prevailed.

The secretary read the first proposition, as follows:

1. Three commissioners, or such other number as the legislature may deem proper, shall be appointed by some competent authority, to hold their offices for the term of five years, and shall report annually to their legislature.

Mr. Poole, of Indiana—I move its adoption.

The motion prevailed.

The secretary read the second proposition, as follows:

2. Such commissioners shall watch over the general welfare of the cattle within the state for which they are appointed, and particularly for the purpose of preventing the spread of dangerous diseases among them, and of protecting the people of the state against the dangers arising from the consumption of diseased meat.

The President—I would suggest that, perhaps, the word "animals," would be preferable to "cattle."

Mr. Gould, of New York—On behalf of the committee, I will accept that suggestion as an amendment, Mr. President.

Mr. Poole, of Indiana—I move that the proposition be adopted, as amended.

The motion prevailed.

The secretary read the third proposition, as follows:

3. They may, from time to time, appoint such assistant commissioners, to aid them in the discharge of these duties, as the welfare of the public may require.

Mr. Poole, of Indiana—I move, Mr. President, the adoption of that proposition.

The motion prevailed.

The secretary read the fourth proposition, as follows:

4. They should have power to administer oaths, and to prescribe, from time to time, such rules and regulations as may be necessary to accomplish the objects of their appointment.

Mr. Poole, of Indiana—I move the adoption.

The motion prevailed.

The secretary read the fifth proposition, as follows:

5. They shall give the public notice of the outbreak of any dangerous disease, and such practical directions for its avoidance as they may deem necessary.

Mr. Poole, of Indiana—I move its adoption.

The motion prevailed.

The secretary read the sixth proposition, as follows:

6. They may either place such diseased animals in quarantine, or cause them to be killed, as may seem necessary for the public protection; but, in the latter case, they shall cause an appraisal

of such animals to be made, and the county or state shall pay such proportion of the appraised value as may be provided by law.

Mr. Poole, of Indiana—I move its adoption.

The motion prevailed.

The secretary read the first proposition, of the second general division, as follows:

1. The commissioners, or any assistant commissioners located in the frontier of the state, shall, at such times as may be prescribed by the commissioners, have power to inspect all the cattle brought into such state, whether by railroads, vessels and common roads, and shall have power to detain such railroad cars, vessels and droves or animals on common roads, long enough to make a proper inspection of them, for the purpose of ascertaining their sanitary condition.

Mr. Poole, of Indiana—I move its adoption, Mr. President.

The motion prevailed.

The secretary read the second proposition, of the second general division, as follows:

2. No animal shall be permitted to enter the state which shall be deemed by such assistant commissioner to be capable of diffusing dangerous diseases, or of injuring the health of the inhabitants.

Mr. Reynolds, of Illinois—It strikes me, Mr. President, that one man is, by that section, permitted to exercise a very great authority. It seems to me that provision should be made by which an appeal can be ultimately taken to the decision of the commissioners themselves.

Mr. Gould, of New York—Allow me to remark, Mr. President, that the committee recognize the full force of the objection made by the gentleman from Illinois (Mr. Reynolds), but it seemed as if we were reduced merely to a choice of evils. If any possible way could be provided by which a council could be held, I should be very much in favor of any proposition looking to the accomplishment of that end; but here is a train coming in, there is no time to stop; the assistant commissioner discovers this disease, and he must either have the power to promptly detain such animals or run the risk of diffusing these horrible cancers, of which I have before spoken, through whole communities.

I suppose that the states will appoint gentlemen of character and responsibility as commissioners, and the only way that I see of obviating the difficulty is by providing for an appeal to them, and giving them power to at once remove any assistant who acts corruptly or viciously.

Mr. Reynolds, of Illinois—All I desire, Mr. President, is to devise some means by which, in case of difference of opinion, an appeal may be taken from the assistant commissioner to higher authority.

Mr. Smith, of Missouri—It seems to me, Mr. President, that there can only be one way by which the suggestion of the gentleman from Illinois (Mr. Reynolds) can be carried out, and that is by providing for an appeal to all the commissioners—the cattle being arrested in transit until a decision is had from them.

In case of a provision of that kind, it seems to me that unless the owner of the cattle should consider himself very much aggrieved by the decision of the assistant commissioner, he would not be willing to submit to the delay incident upon an appeal to the full board, but would prefer to abide by the first decision.

I move to amend by adding to that section, "and an appeal shall be allowed to the commissioners in all such cases."

The President—Suppose we weigh this matter a little, gentlemen. Take the case of cattle being detained at Buffalo. I can be readily on hand, but another member of the board, Mr. Patrick, lives in Syracuse, one hundred and fifty miles from there, while yet another member, Mr. Gould, lives in Hudson, which is two hundred miles further east. There would be a very great inconvenience in getting these gentlemen all together, though two could be quite easily reached, and I suppose that would be the case in other states as well. Suppose, sir, that instead of "commissioners," you say, "to a majority of the commissioners."

Mr. Smith, of Missouri—I accept your amendment, Mr. President.

Dr. Rauch, of Illinois—I will suggest, Mr. President, that instead of saying "a majority of the commissioners," say "one commissioner," for it is absolutely necessary, sometimes, that cattle should be stopped at once, and also, that in case of difference of opinion, a decision on appeal should be had in the shortest possible time.

Dr. Morris, of New York—Mr. President, I heartily second the motion of the gentleman from Illinois (Dr. Rauch); for I fully appreciate the motives which caused him to make it.

Butchers are very anxious to get the cattle into the slaughter houses. They can be bought at reduced prices, on account of defects, extensive bruises or disease; then the butchers will take them and spirit them away, right under the eye of the commissioner, if that can possibly be done. I had that occur in my own experience, and remember one case, particularly, where eighteen head were taken out of the yard without a permit and driven to the slaughter house, where they would have been beef within an hour, if I had not discovered the facts.

The power of assistant commissioner, in these cases, should be absolute and without any appeal, for in no other way can these animals be certainly detained.

PROF. SMITH, of Missouri—I see precisely the same difficulty as the gentleman from Illinois, (Mr. Reynolds) does. Here is a herd which the inspector wishes to stop. The drover is anxious to get on, and will give $100 to go through and say nothing—that, of course, we cannot prevent. But, suppose the inspector chooses to stop them for his own satisfaction, then, either party may appeal to the commissioner. I do not believe that so much power should be entrusted to a single inspector, from whose decision no appeal can be taken.

MR. POOLE, of Indiana—I merely wish to make one remark, Mr. President. I was a member of that committee whose report is now under discussion, and while I do not like any exercise of arbitrary power in a free government like ours, there are yet times, occasions and circumstances that necessitate it. We acknowledge it and have acknowledged it in our government from time immemorial. For instance, coming to New York from Europe, you are boarded at Sandy Hook, and the vessel is examined, and if there happens to be any one on board with anything like a contagious disease, that person is forced to remain at quarantine as long as the officer sees fit. We are asking, only, that the one-man power shall be used in a case somewhat parallel, for is it not as positively an actual necessity that cattle should be prevented from shipment, who would breed an infectious disease, not only among their own kind, but among the human family as well. I think that the safety of the people of all communities, throughout the country, requires that this arbitrary power shall be used, at times, as an exigency that cannot be avoided.

Let the resolution pass; then let each legislature protect its own people as the circumstances and localities of the state require—as they certainly will do, no matter what we recommend here.

DR. MCMILLAN, of Ohio—I think, Mr. President, we had better let this matter remain as it is. I presume that none of our legislatures will appoint commissioners without first requiring them to give heavy bonds for the performance of their duty. If, then, a commissioner damages a dealer by arresting his stock, he is made responsible, and the courts will try the question.

DR. KILE, of Illinois—As a deliberative body, Mr. President, we should recommend nothing that will not be found beneficial to and be enacted by the different states. Now, while such a proposition as this which is proposed might be adopted, for instance, in other parts of the country, how could it be made to work in a state like Illinois, with her 2,000 miles of railroad; with ferries at every crossing for 400 miles along the Mississippi, and for 300 or 400 along the Ohio and Wabash. In Pennsylvania and New York, there are a few single points to which all cattle tend, and where they can be inspected without any trouble to the shipper or to the purchaser. But suppose, that here, at any point in Illinois, I am obliged to halt a drove of cattle at Tolono, until the commissioners—scattered all over the state—for there will have to be a very great many of them—shall have decided my appeal. Why, sir! the whole scheme is perfectly futile. So far as the State of Illinois is concerned, I cannot see that it would be of any practicable benefit.

While I am ready to admit that this proposition will work very well in the eastern States, I do think that it proposes to place too much power in the hands of one man, in view of the manner in which this power must be distributed over this section of the country.

DR. MILES, of Michigan—Mr. President, it is certainly time that somebody must have the power to stop diseased animals, if we have any sanitary regulations whatever. I do not exactly appreciate the point of the last gentleman, relative to his cattle being stopped at Tolono, for if they are diseased, they certainly should be stopped the very first start, in order that the eastern states and the rest of our new territory may be protected.

Then, again, if it is understood that diseased animals are not to be allowed to go forward, dealers will be very careful how they start such in the first place.

MR. MCCOY, of Kansas—It does seem to me, Mr. President, that this measure proposes to vest too much power in one man, and besides that, in view of the laws of some of the States, it would be practically impossible to carry it out. In Missouri, for instance, it is provided that each county shall appoint three commissioners, who shall constitute a board of cattle inspectors, whose duty it shall be to inspect cattle when presented, and, if found healthy, to admit them.

The appealing from the decision of one of these commissioners would, if such a proposition as the one proposed were enacted into a law, be almost ruinous to the drover. The consequence would be that very many of these officials, knowing the unwillingness with which an appeal would be taken, would levy black-mail on the cattle passing through their district, whether they were healthy or not.

Or, if the one-man power principle should prevail, no means of appeal being provided, every one who knows anything about our western country can but see how great a detriment it would work to the bringing forward of our cattle. That man would have the power, as we express it west, to make every drover bringing in cattle for inspection, "come down" a little, or very politely inform him that his cattle are diseased. Time and again, I have heard drovers coming through the southwest say, in being asked how they succeeded with these commissioners—"Well, I presented a few green arguments to them, and it was the easiest thing in the world for them to see that my cattle were healthy."

I tell you, gentlemen, this measure proposes to put too much absolute authority and power in the hands of one man, especially when no means of appealing from his decision are provided.

Mr. Barrett, of Missouri—There certainly, Mr. President, ought to be some provision by which the cattle-drover may be protected. If you provide for an appeal from the decision of an assistant commissioner to a commissioner or to several commissioners, that functionary is going to be very careful how he stops cattle, and if he does stop them when they are not diseased, in order that he may gain a certain sum of money thereby, he will most certainly lose his position, when the case in which he has so conducted himself comes to be investigated.

I do not wish to detain the convention, Mr. President, and am not anxious to make any speech.

Mr. Hamilton, of Pennsylvania—I am in favor, Mr. President, of letting each legislature decide this matter for its respective state. For instance, you here in Illinois can appoint an inspector to inspect an inspector and another inspector to inspect the two inspectors. [Laughter.] Some gentlemen seem to think that inspectors are to be bribed, all over the country; if that does turn out to be the case, then they will all be a set of infernal rascals—and that is something that I do not believe will be the case.

Mr. Piper, of Illinois—There is one point, Mr. President, that strikes me, which is just this. I do not think that any Illinois man is going to bring in diseased cattle—even try to get them passed—when he knows that even if he succeeds in doing both of those things, he has still got the eastern inspections to face.

Mr. Reynolds, of Illinois—I offer the following, Mr. President, as an amendment to the amendment of the gentleman from Missouri (Mr. Smith):

"In case the decision shall be against the inspector, the State shall indemnify the owner for reasonable damages and expenses."

Mr. Smith, of Missouri—I except that amendment, Mr. President.

Mr. Gould, of New York—Mr. President, I call for a division of the question on the amendment.

The motion prevailed.

The President—Gentlemen, you will now vote on the first branch of the amendment, which is, "appeals shall be allowed to a majority of the commissioners in all such cases."

The amendment was adopted.

Ayes 19: nays 12.

The President—You are now about to vote upon the second division of the amendment, which is as follows:

"In case the decision shall be against the inspector, the State shall reasonably indemnify the owner for reasonable damages and expenses."

The amendment was lost upon *viva voce* vote.

The proposition was then adopted as amended.

The secretary read the third section of the second subdivision, as follows:

3. No train shall be allowed to proceed unless the animals contained therein have been supplied with food, water, and rest within twenty-four hours next preceding the time of such inspection.

Mr. Poole, of Indiana—I move that it be adopted.

The motion prevailed.

The secretary read the fourth section of the second subdivision, as follow:

4. All animals shall rest and have access to food and water for twenty-four hours, after having traveled for a similar period.

Mr. Poole, of Indiana—I move that it be adopted.

The motion prevailed.

The secretary read the fifth section of the second subdivision, as follows:

5. The railroad companies shall provide suitable yards for feeding, watering and resting the animals traveling on their trains, and for quarantine purposes, which shall be kept in as cleanly and wholesome condition, to the satisfaction of the commissioners.

Mr. Poole, of Indiana—I move its adoption, sir.

The motion prevailed.

The secretary read the sixth section of the second subdivision, as follows:

6. Each train, on leaving its point of departure, shall have certificates signed by an assistant commissioner, which shall certify that all the animals therein were in a healthy condition at the time of departure, and also the exact time of its leaving; and such certificates and indorsements thereon of the time of resting and the time of departure of the train at subsequent resting and feeding places shall be exhibited to the proper authority whenever required.

Mr. Poole, of Indiana—I move its adoption, sir.

The motion prevailed.

The secretary read the seventh section of the second subdivision, as follows:

7. Proper penalties should be inserted to prevent the bribery of officers charged with the execution of these provisions.

Mr. Poole, of Indiana—I move its adoption, sir.

The motion prevailed.

The secretary read the eighth section of the second subdivision, as follows:

8. Proper penalties should also be provided for those who interfere with or resist the officer, charged with the execution of these provisions.

Mr. Poole, of Indiana—I move its adoption, sir.

The motion prevailed.

The secretary read the third general division, as follows.

3. **Whereas**, A malignant disease among cattle, known as Spanish fever, has been widely disseminated by the transit of Texas and other southwestern cattle through the western and northwestern States, during the warm season of the year, occasioning great loss to our farmers, and possibly endangering the health of our citizens therein.

Resolved, That this convention earnestly recommend the enactment of stringent laws to prevent the transit through these States of Texan or Cherokee cattle from the first day of April to the last day of October, inclusive.

Mr. Earle, of Indiana—I move to amend, Mr. President, by inserting "first" instead of "last" day of October.

Mr. McMillan, of Ohio—And I move to amend, Mr. President, by striking out the "first day of April" and inserting the "first day of March."

Gen. Patrick, of New York—I would like to say a word, Mr. President, regarding this question of time. As to how early in the season it might be wise to admit cattle, I am not able to say, but I do know that on the twenty-fourth day of November, we found in the city of Buffalo, while *en route* for this place, two of the sickest and most thoroughly diseased Texas steers I have ever seen—one of which died within an hour or two, and the other of which would have died within twelve hours, had it not been killed for the purpose of examination. This happened after we had had heavy frost and some snow. I think, as we know from Mr. Hill's statements, the disease still exists in this State.

Mr. Christie, of Canada—If I mistake not, Mr. President, it has also been stated that this disease is still prevailing in St. Louis.

Mr. Poole, of Indiana—I am told, Mr. President, by gentlemen who had much more experience in this matter than I have had, that they are perfectly satisfied there is no danger at all after the first of October, by which time, as a general thing, we, here in the west, have heavy frost. It is not expected that cattle brought here at that time would be shipped—they could not be, on account of their poor condition; the idea is to keep them here all winter, feed and graze them the next season, and the next fall send them to a market. There may be isolated cases of the disease, and some cattle may die after the first of October. And, as regards the statement of Mr. Hill, I understand him to say that the animals referred to died from the effect of disease imported by cattle in the hot season, and not from cattle brought this fall—and he distinctly states that to be the fact. His remarks, therefore, furnish no data for supposing that cattle bring any disease among us as late as October.

Gen. Patrick, of New York—My impression is, Mr. President, and I will state that it is so with another of our commissioners (Mr. Gould), that the cattle we saw in Buffalo were from a herd just purchased and brought forward from Kansas.

We, of course, understand the propriety of bringing cattle into this State at as early a day as possible, for the reasons already stated, but some safeguards certainly should be thrown around the trade, by which the shipment of such cattle may be prevented.

Mr. Christie, of Canada—Mr. President, Mr. Hill's statement, as I understand it, was this—that those steers died within eight days. What does that statement prove? It proves just this, that if they had not been in contact with Texas cattle since the cattle belonging to the same herd died (and I understand that to be Mr. Hill's statement), that those cattle were contaminated by the native cattle of the same herd, and after the period necessary for the second incubation of the disease had elapsed, took that disease and died. This one instance sufficiently proves the impropriety of allowing cattle to come in at an earlier date than is specified, because what has happened in Illinois may happen in Kansas. It also establishes the fact that the disease may exist up to the twenty-fourth day of November—the meeting with it at Buffalo at that time, has already been spoken of—and for all we know, it may exist later still.

Dr. Johns, of Illinois—So far as I am advised, Mr. President, cattle in the condition of those met with at Buffalo, have never imparted the disease under any circumstances, for as we learned the the history of this disease, it has never been communicated except by cattle in apparent health. We have no testimony that those cattle had imparted the disease (in fact, the universal testimony is, that it is not communicated after frost), though they may have had and probably did have it.

Mr. Hill has not stated what the cattle spoken of by him died from, and those gentlemen who jump at the conclusion that they died from Spanish fever, have very slight grounds for their belief. In the west, nothing but a post mortem examination can determine as to whether a certain animal has died of this Spanish fever—and it is not stated that these steers were so examined.

Mr. Earle, of Indiana—I hope, Mr. President, that gentlemen will consider well, before casting their vote, for it is of the utmost importance that these cattle should be brought in here at as early a day as possible, in order that they may rest before cold weather, get well over their bruises and take their winter feed properly. If they cannot be brought in until November or December, they become so sore and are in such bad condition that they will not take their feed and go through the winter as they ought.

Mr. Gould, of New York—Mr. President, our experience in New York shows that it will not be safe to admit cattle into that State at as early a period as is proposed by the amendment. As was stated by my friend (General Patrick), this disease has manifested itself as late as the twenty-fourth of November, and I may state in addition to that, that in the county of Orange, on the twenty-sixth day of October, a native cow died, which had taken the disease from another native animal. There are cows in the State of New York which could not be purchased for fifteen thousand dollars; there are also cows and bulls in Canada that could not be purchased for a very large sum, and in both sections there is a large amount of very fine stock. It behooves us, therefore, to be exceedingly careful how we expose our herds to the ravages of this fearful disease.

But why cannot we change this proposition, so as to admit these cattle into Illinois and the grazing States (as they seem to desire), on the first day of October, while we substitute the first day of November for the province of Canada, the State of New York, and the States lying east of New York. It seems to me that by agreeing upon that, we can act harmoniously.

Mr. Moore, of Missouri—If that proposition suits New York, Mr. President, it suits Missouri. Illinois knows what she wants, but we in Missouri don't wish to have these animals brought through that State at so early a day as some gentlemen propose.

Dr. Miles, of Michigan—While I am anxious, Mr. President, to facilitate the transmission of cattle to eastern markets, it is of the utmost consequence that we protect ourselves; but as Missouri, Kansas and other States lying farther west, are as much interested in this matter as we are, and understand it better, I would like to hear from gentlemen representing these States, in regard to the matter.

Mr. McCoy, of Kansas—Mr. President, through this portion of Illinois, a large portion of Missouri and Iowa, and also a portion of Kansas, the farmers rely upon disposing of their products by preparing fattening stock for the eastern markets.

Again, sir, there is no proposition embodied in this report whereby cattle from the Southwest, even after being wintered, may be moved to market, notwithstanding there are to-day, coming into Illinois, by the Union Pacific Railroad, ten thousand head of southwestern cattle, which are to be fattened this winter upon the pastures of Illinois particularly, and of Indiana, in part—a large per cent of which will be ready to go to market in July. But, as I have said, there is in the proposition no provision, whereby those cattle, when fattened, may be permitted to go to market.

Again, do you propose, gentlemen, to prohibit the people of the Southwest from coming to market at all—do you propose to make recommendations here to-night, the practical effect of which would be to exclude us utterly and completely? I believe every gentleman, in his own heart, would answer "no." But, I declare to you that such will be the practical effect of these propositions, if embodied and enforced as laws.

This is all that I have to say, gentlemen; you can do as you like, but you must take the responsibility.

Mr. Poole, of Indiana—This resolution, Mr. President, is not such a one as will suit the States of New York, Illinois or Indiana, for this reason: That resolution says, "Texas cattle shall not be admitted from the first day of April to the last day of October." It terms are broad enough to prevent from being shipped to market, cattle which have been wintered and fattened here. Some discrimination must be made, specifying more particularly what animals are meant.

The President—The understanding of the resolution by the chair is, that cattle shall not be introduced from the southwestern country into these States.

Mr Poole—But it does not say so, sir, and any such construction must be an inference only.

By the way, in regard to those cattle at Tolono, I do not think that case goes, by any means, to show that those animals took the disease from native cattle.

Mr. Christie, of Canada—How do you account for it, sir?

Mr. Poole—In the same way as you, sir, as a common-sense man, would account for a great many contagious diseases through the United States, both among the human family and animals—that is, that some persons will be affected by a disease very quickly, while in others it will linger and linger for months, before breaking out. I leave it to any medical or scientific man, if that may not be the case here, for these cattle ran in the same places and over the same trails as did those who took it so early and died. They may have become gradually infected with the disease, and the poison have worked very slowly in the system, but in the course of time, have sickened and died from it.

Mr. Christie, of Canada—The simple answer to all that, as it seems to me, Mr. President, is, that, as yet, we have no evidence showing that the time necessary for the incubation of the disease is longer than ten weeks.

Mr. Earle, of Indiana—When did the Texas cattle that died in Buffalo, take this disease?

Mr. Christie—I cannot say, sir. They may have come directly from Texas, but that is an answer, so far as the picking up of their pasturage in the same field where the Texas cattle had pastured, is concerned.

And then, again, according to the gentleman's own statement, a severe frost will kill this disease.

Mr. Poole, of Indiana—We all know, Mr. President, that both animals and persons freely take contagious and infectious diseases at different periods, as for instance, I have known some animals to take this Texas cattle disease in three weeks, others to have been seven weeks in contracting it, and others probably ten, and this being so, might not the periods be still further extended?

Dr. Miles, of Michigan—The gentleman speaks, Mr. President, of the time required for taking this disease. I should like to know if he means after the exposure of the animal, the period of incubation, or the time that the native cattle may run with the Texas cattle without taking it.

Mr. Poole—I meant, Mr. President, from the time the animal was exposed, until it exhibited any sign of the disease.

Dr. Miles—It is said, Mr. President, that native cattle may run with Texas cattle a long time without contracting the disease—that when separated, some have not taken it all; while others which remain will have it.

Mr. Poole—They may, or may not. Mr. Eaton will tell the gentleman that some never take it.

I have certain knowledge, sir, of some native cattle that have run with Texas cattle the whole summer, without contracting any disease at all. So also, I know, that some men have passed into a small-pox room and staid there a week without contracting that disease; while I know others who have taken it a long time afterwards.

And so, in regard to these steers that have been spoken of. My idea is that they actually imbibed a small amount of this disease at the same time that these other cattle did, but that it remained in their systems in a very small speck, so to speak, until gradually extending, they became, after quite a long time, infected with it, and so died.

Mr. Christie—Four months.

Mr. Poole—Yes, sir; that seems to me not at all improbable, Mr. President, in view of the statements we have already had, to the effect that cattle placed in pasture where Texas cattle had run and pastured the winter before, had, the next season, taken this disease and died.

I will say, however, that after careful inquiry and diligent search of reports, I have never yet heard of or seen recorded a single case of Texas cattle fever occurring in Texas or along the gulf coast. That being so, it seems to me that the whole history of the disease may be summed up in this—that the abuse of these cattle, and the over-driving of them while on their way, by being crowded in the cars and steamboats, and forced along in that brutal manner that is too well known, breeds an infection in the system. That is my idea of this matter.

We are willing, as western men, to divide the time and make it, say the fifteenth of October.

The amendment was accepted.

Mr. Reynolds, of Illinois—It seems to me, Mr. President, that this matter can all be arranged if a blank is left for the time. Each state can settle this matter for itself. By adopting this course (especially in view of the fact that you have appointed a commission which certainly ought to be able to fix upon a proper time), no harm can be done, and this convention need not be troubled further.

Mr. Christie, of Canada—The adoption of that suggestion, Mr. President, will cause all the proceedings of this convention to be a perfect nullity.

I wish to call the attention of the convention to the laws of the states west of this. Missouri says: "Nothing contained in this act shall be so construed as to prevent the transportation of such cattle through this state, on railroads or steamboats, or to prohibit the driving through any part of this state of such Texas or southern cattle as have been wintered at least one winter north of the southern boundary of the state of Missouri."

Kansas enacts: "No person or persons shall be allowed to drive or cause to be driven into the state of Kansas, or through any part thereof, any cattle from the Indian territory south of Kansas, or from the state of Texas, that may have come into the state between the first days of March and December of each year."

The law of the state of Illinois is entirely prohibitory.

The law of Kentucky was: "It shall be unlawful for any person, after this act takes effect, during the time between the first day of March and the first day of November, in any year," etc. That law was amended this year, to read as follows: "That an act approved February 28, 1867, entitled 'an act to prohibit the importation and sale in this commonwealth,' be and the same is so amended that it shall be lawful to import such cattle into the state at any time between the twentieth day of November and the first day of April in each year."

These are the laws fixed by the legislatures of several of the states that have suffered very much from this disease, and it does seem to me that they furnish some reliable data by which this convention may be guided.

I cannot believe that we have come together from such long distances, and at, in many cases, so much inconvenience, to pretend to thoroughly discuss the series of propositions for the purpose of controlling this disease, and then to, after all, acknowledge to the world that we knew nothing at all about it, and that cattle may be admitted at any time during the year.

Mr. McMillan, of Ohio—It seems to me, Mr. President, that we should act on the safe side, regarding this matter. It does not appear that there really is not danger, more or less, at any time of the year, and if three or four months are set apart during which these cattle may be brought in, I do think that all is conceded that should be asked for, and that we are entitled to demand for the rest of the year such protection as our home interests require.

I therefore move to amend so that the dates shall read from "the first of March to the first of November," and on this I move the previous question.

The President—Gentlemen, you have heard the motion, will you sustain the call for the previous question?

("Call the roll—call the roll.")

The President—The secretary will call the roll.

Accordingly the roll was called.

The motion prevailed.

Yeas, 24—nays, 7.

The President—Gentlemen, you will now vote on the motion of the gentleman from Ohio (Mr. McMillan), that Texas cattle shall be excluded between the first day of March and the first day of November.

The motion prevailed.

Mr. McMillan, of Ohio—I move, Mr. Presinent, that the original proposition, as amended, be now adopted.

The President—Mr. Secretary, you will please read the last paragraph of the report submitted by your committee.

The secretary read as follows:

Resolved, That the interest of the community require the enactment of laws making any person responsible for all damages that may result from the diffusion of any dangerous disease from animals in his ownership or possession.

Mr. Poole, of Indiana—I move, sir, that it be adopted.

The motion prevailed.

Mr. Christie, of Canada—I move, Mr. President, the adoption of the report as a whole.

The motion prevailed.

Mr. Hamilton, of Pennsylvania—Mr. President, I offer the following resolution:

Resolved, That the governor of Illinois be requested to have printed and forwarded to the governors of the several states here represented, and to each delegate, a copy of the propositions just adopted.

I offer this resolution, Mr. President, in order that these drafts of proposed laws may be transmitted to the governors of the respective states who have sent us here, and be by them embodied in their "messages," as I know some, at least, desire to do.

Mr. Gould, of New York—I must confess, Mr. President, that it does not seem to me the most delicate thing in the world for representatives of the different states to request the governor of Illinois to take upon himself all the trouble and expense that will be incurred if the resolution is adopted.

Dr. Clendennin, of Ohio—That is exactly my view of the case, Mr. President, and besides, I presume that the chairman of each delegation will report to the governor of his own state such of our proceedings as may be by him deemed necessary.

Mr. Christie, of Canada—I have net the slightest idea, Mr. President, that the governor of Illinois will regard such a request from this convention at all out of place. I renew the motion for the adoption of the resolution.

The motion prevailed.

Mr. Reynolds, of Illinois—I move, Mr. President, that we do now adjourn to nine o'clock to-morrow morning.

The motion prevailed.

So the convention adjourned.

THIRD DAY.

Thursday, December 3, 1868.

The convention met pursuant to adjournment.

Dr. Snow, of Rhode Island—Mr. President, the committee appointed on the subject of a name whereby the disease under consideration may be designated, have instructed me to report the term "Texas cattle fever," as being, upon the whole, a designation which will be best understood, and the most acceptable to the people.

Mr. Earle, of Indiana—I move, Mr. President, that the report be received and concurred in.

The motion prevailed.

Mr. Poole, of Indiana—Mr. President, as the propositions adopted by us yesterday, for the purpose of being enacted into laws by the legislatures of the respective states, make no discrimination between cattle directly from Texas and those which have been wintered and prepared here for market, I offer the following resolution, as explanatory of the interpretation which this convention gives them. It is as follows:

Resolved, That in the resolution passed by this convention in regard to Texas and southwestern cattle, and the time of their being admitted into the different states, it was not intended to mean or be construed to include Texas or southwestern cattle that had been wintered in any of the states, except in Texas, the previous winter.

I move the adoption of that resolution, sir.

The motion was seconded.

Dr. Morse, of Missouri—I do not think, Mr. President, that there is anything particularly wrong about this resolution, but there may be; and as at least one-third of the convention which adopted the propositions of yesterday (of one of which this resolution is said to be explanatory), have already left the city, it would be manifestly unfair for us to adopt this.

Dr. Townsend, of Iowa—I quite agree, Mr. President, with the gentleman from Missouri (Dr. Morse), that it would hardly be fair now, to add any new matter to what has already been passed upon by this convention. I hope the gentleman will not press the resolution.

Mr. Poole, of Indiana—It was distinctly stated last night, Mr. President, if I am not very much mistaken, that the proposition of which this resolution is intended to be explanatory, was not intended to include cattle wintered in the western or northwestern states previous to their being sent to market.

The President—That would be the understanding of the chair.

Mr. Poole—Exactly, Mr. President; and I am satisfied that there was not a member of the convention but who understood it in the same way.

Mr. Earle, of Indiana—Allow me to state, Mr. President, that I personally spoke to the chairman of the Canadian commissioners (Mr. Christie), in regard to this matter. I was informed by him that they interpreted the proposition of which this resolution is intended to be explanatory, exactly as the chair does; and I know that to be the sentiment of the convention at large.

I hope gentlemen will not embarrass what we have already done by voting down this resolution, for its adoption is really necessary to a proper understanding of our proceedings by those into whose hands they may hereafter come.

Dr. Miles, of Michigan—This same matter was broached at our last session, Mr. President, and it was admitted on all hands that there was no necessity of adopting anything of an explanatory nature. I think, myself, that there can be no misunderstanding in regard to it, as it now stands; and I do hope that this fragment of the convention will not attempt to explain what the whole convention considered sufficiently clear.

Mr. Chadbourne, of Wisconsin—I think, Mr. President, that it is unfair for so small a number of us to change what was last night adopted by the whole convention. I voted on the question of time during which Texas cattle should be admitted, in accordance with what seemed to be the desire of the states mostly interested; though my own judgment was, that, in some of the states at least, cattle might be introduced by the first of October.

But at any rate, the whole convention having recommended a certain measure for adoption by the state legislatures, I do not think that so small a number as are now present should meddle with the subject further.

Dr. Rauch, of Illinois—Regarding the time at which Texas cattle should be admitted, Mr. President, I quite agree with the gentleman from Wisconsin (Mr. Chadbourne), for I am satisfied from the experience of the past season that they can be brought to Chicago by the first of October, without any danger. But I scarcely think it is necessary, or that it was expected, that the proposition under discussion should apply to Texas cattle wintered here, and fattened during the next summer for the eastern markets.

The President—I would simply remark, gentlemen, that at Buffalo, of which point I have supervision, and where there are, say, two to three car loads of cattle arriving daily, it is one of the most difficult things in the world for the commissioners to ascertain whether those cattle have been in the western country a year or a month.

Mr. Poole, of Indiana—I merely offer this resolution, Mr. President, for the purpose of explaining a proposition which, as it now stands, might be considered by one person reading the reports of our proceedings to mean one thing, while another would construe the language to mean exactly the opposite thing. It seems to me exceedingly important that when the legislatures of the respective states consider our propositions for the purpose of enacting them into laws, there should be no possibility of misunderstanding on this point—that it should be distinctly understood that, between the dates specified, we did not mean to exclude cattle that had been here a year or two, undergoing preparation for market.

I believe it is conceded that that was the understanding of the whole convention upon adopting this proposition at the last session. That being so, there can be no unfairness in the adoption of this explanatory resolution by those of us now present.

Mr. Gould, of New York—I hardly think, Mr. President, that the terms of this resolution are sufficiently guarded, but the general idea of it is eminently fair and proper, for we certainly do not wish to retain for a long time, in this western country, cattle that have been thoroughly disinfected.

When Texas cattle are brought to the frontier of any state, the commissioners and assistant commissioners thereof must be relied upon to determine any question of fraud with regard to the place of their importation and the time which they have spent there, and our people should not be deprived of a large amount of entirely unexceptionable beef through any ambiguity in our proceedings.

I cannot believe, Mr. President, that the important stock-growers and forwarders of the state of Illinois, or of any others of the western or northwestern states, would deliberately swear to a lie regarding the length of time their cattle may have spent in their section subsequent to their leaving Texas, and prior to their being forwarded to a market. I cannot believe it, sir, in face of the fact that as soon as Mr. Alexander was apprised of the diseased condition of his cattle he went around to gentlemen who had bought a portion of them (and that, too, without waiting for them to come to him), paid back to them the purchase money, and submitted, in the first instance, to a loss of twenty-seven thousand dollars. I do think that as long as there are men in the western country who pursue such a course as that, we may venture to take their affidavits with regard to anything concerning their cattle.

I should feel perfectly satisfied, as far as New York is concerned (and I believe other states will feel perfectly satisfied), with a proper affidavit, from an honest man, that his cattle have been for a certain time, say ten months, in the state of Illinois, for instance, being fed and fattened for a market. I should therefore be in favor of the resolution, with some little addition, like this, for instance, "provided that proper proof should be afforded," etc.

Mr. Poole, of Indiana—I accept that amendment, Mr. President.

Mr. Emery, of Illinois—It seems to me, Mr. President, that we shall find the result of this to be that all the stock of the state will be old stock.

Mr. Gould, of New York—I do not quite agree with the gentleman, Mr. President, because, as the proposition now stands, not a single Texas animal can be received after the first of March. The point is this, that there are now in this state, for instance, a vast number of cattle which will be in proper condition to send to market in May or July, but which are excluded by the terms of the resolution, as it now stands, and I do think that some provision should be made by which that difficulty can be avoided. It seems to me that it is nothing more than fair dealing with our western friends—who have so generously endeavored to meet with our wants, that I, for one, wish to show a similar spirit of amity in protecting their interests.

Dr. Townsend, of Iowa—I wish to say just a word or two more upon this subject, Mr. President. Last night, when this matter was up for consideration, several of us desired an adjournment, in order that this and other points might be deliberately acted upon. The convention did not adjourn, but its work was then supposed to be finished. And now that we have committed the very common folly of putting our work through in a hurried manner, we ought to take the consequences, and not, in this way, endeavor to perfect measures which ought to have been more carefully considered.

Again, the fact that we have this large amount of cattle in Illinois, is not going to embarrass the owners of them at all, for our resolutions and propositions are not the law of the state yet, by any means, and when they are enacted into laws the legislature will doubtless provide the necessary safeguards and explanations. I therefore do not think that this resolution is at all necessary.

Mr. Hamilton, of Pennsylvania—I was at first inclined to favor this resolution, Mr. President, but now I shall vote against every proposition to amend what was done last night. First, because I do not think that so small a number of the convention as are now present, should meddle with what was passed upon by the whole convention. And secondly, because the legislatures of the several states will undoubtedly remodel our propositions and resolutions in such a manner as will best meet the wants of their constituents.

Gen. Patrick, of New York—It strikes me, Mr. President, that practically, this thing takes care of itself; for nearly, if not quite all of these cattle spoken of will have gone to market before the several legislatures will have taken action on our recommendations.

Besides that, the expression of opinion regarding the interpretation of this particular resolution, and the views in reference to it are so harmonious, that I do not think our intention can be misconstrued.

It does seem to me, too, that it will be acting unfairly towards the large majority of this convention—who have gone away supposing the work of this convention was practically completed—to attempt to re-open this mater.

Mr. Gould, of New York—I offer, Mr. President, the following, and move that it be inserted after the excluding paragraph in the original resolution as reported by the committee:

"*Provided*, that it may be lawful to receive at any time cattle which have been ascertained, by proper proofs to have been fed in any state north of Arkansas for a period of ten months next preceding the time of passing the frontier of any state."

Mr. Poole, of Indiana—I do not accept, Mr. President, the proposition of the gentleman from New York (Dr. Gould) for this reason: If the amendment should be adopted by the convention, and be promulgated as law by our next legislature, it would preclude our cattle from going to market during the summer, as scarcely any that are now being and that will, during this winter, be prepared for market, will then have been within the state so long a time as ten months.

Mr. Gould—Say eight months, then.

Mr. Poole—As this resolution has occasioned a great deal of discussion, Mr. President, and has excited some considerable opposition upon one ground and another, I now withdraw the resolution and move that we adjourn *sine die*.

Mr. Earle, of Indiana—Then, Mr. President, I offer the following:

Resolved, That all Texas or southwestern cattle that have been wintered in the state, shall be considered as native cattle.

MR. GOULD, of New York—I offer this as an amendment, Mr. President: "And that have been ascertained by proper proofs to have been wintered."

MR. EARLE—I accept that amendment, Mr. President. I move that the resolution be adopted as amended.

MR. CARTER, of Maryland—I offer the following resolution, Mr. President, and move its adoption:

Resolved, That the thanks of this convention are eminently due, and are hereby tendered to the Hon. Lewis F. Allen, for the able, courteous and impartial manner in which he has discharged the arduous duties of president of this convention.

Gentlemen, you have heard the resolution. As many as are in favor of its adoption, will please so signify it by saying aye.

The resolution was unanimously adopted.

MR. CARTER, of Maryland—Mr. President, I offer the following resolution and move its adoption:

Resolved, That the thanks of this convention are hereby tendered to the Governor and cattle commissioners of the State of Illinois, and the citizens of Springfield, for the kind and liberal hospitality extended the members of the convention during our sojourn in their midst.

The resolution was unanimously adopted.

MR. CARTER, of Maryland—I offer the following, Mr. President:

Resolved, That the thanks of the convention are hereby tendered to Hon. Joseph Poole, of Indiana, temporary chairman, and the officers of the convention, for their efficient discharge of the duties of their respective positions. Also, to Dr. Morean Morris, of New York City, and Dr. John H. Rauch, of Chicago, Illinois, for their valuable contributions to the scientific information of the convention.

The resolution was unanimously adopted.

DR. CLENDENNIN, of Ohio—Mr. President, I offer the following resolution:

Resolved, That the secretaries of this convention, together with the members from this state—who shall be appointed by the chair—be constituted a committee to superintend the printing and publication of the proceedings of this convention.

The resolution was unanimously adopted.

THE PRESIDENT—I appoint Messrs. Rauch and Emery, of Chicago, and Mr. Reynolds, Secretary of the State Agricultural Society, to act in connection with the secretaries, in preparing for publication a report of our proceedings.

DR. MILES, of Michigan, Mr. President, I move we take from the table the resolution in regard to the appointment of a commissioner for the purpose of investigating the Texas cattle disease.

The motion prevailed.

DR. MILES—That resolution, as originally offered, Mr. President, was to memorialize "Congress." That was stricken out and "war department" inserted. Then, a substitute was offered, authorizing this convention to appoint a commissioner. The whole matter was laid upon the table. The first question, therefore, would be upon the substitute, which I hope will be voted down, as it is ascertained that we cannot command the services of those scientific gentlemen, who were then supposed to be available. We need information at once, and I am satisfied that we can get it in the best manner, from the war department, through its detailing scientific gentlemen to proceed to Texas, and there collect everything necessary to supplement the investigations already made in New York. I hope, therefore, that the substitute will not prevail; but that the original resolution, as amended, will be adopted.

DR. CLENDENNIN, of Ohio—Inasmuch, Mr. President, as it would be of no use to memorialize the war department, I move that we reconsider the amendment, whereby, in the original resolution "Congress" was stricken out and "war department" inserted.

The motion prevailed.

DR. CLENDENNIN—I now move that the amendment be laid upon the table.

The motion prevailed.

GEN. PATRICK, of New York—Mr. President, I suggest this, "that Congress be requested to make an appropriation, to be expended under the direction of the war department," etc. I do not offer that as an amendment, though I think the adoption of it, as such, would secure all that we desire.

DR. CLENDENNIN—I will accept that, Mr. President, as an amendment. I move the adoption of the resolution as amended.

The motion prevailed.

THE PRESIDENT—I appoint, to serve on that committee, Messrs. Clendennin of Ohio, Rauch of Illinois, Gould of New York, Miles of Michigan, and Townsend of Iowa.

Dr. Clendennin, of Ohio—Mr. President, as we all appreciate the importance of obtaining more general and accurate knowledge of the diseases incident to our native stock, I offer the following:

Resolved, That the delegates of the several states here represented shall feel themselves called upon to represent to the legislatures of their respective states the necessity of adopting some measures for the collection and diffusion of more accurate knowledge relative to the habits and diseases of our domestic animals.

In the west, Mr. President, we have no institution specially set apart for these purposes, though I am aware that in New York you have. I believe that such a resolution as I have offered, emanating from this convention, will receive intelligent and favorable consideration, I move its adoption.

The motion prevailed.

Mr. Reynolds, of Illinois—I offer this resolution, Mr. President:

Resolved, That when the committee on publication shall have prepared the report of the proceedings of this convention, they be and hereby are requested to forward a copy thereof to the Governor of Illinois for publication.

Mr. Gould, of New York—Though this resolution is offered, Mr. President, by a member from Illinois, I feel very delicate about asking the Governor of this State to incur this expense on behalf of the convention, and I must confess that it does not seem to me just right to throw the whole burden, at least, upon Illinois.

Mr. Reynolds, of Illinois—I am authorized to say, Mr. President, that Governor Oglesby is willing to receive the report as indicated in the resolution, and further, that he will see the proceedings published and distributed to the members of the convention, the heads of states and wherever else may seem most desirable.

I move the adoption of the resolution.

The motion prevailed.

Mr. Hamilton, of Pennsylvania—Mr. President, I move that we do now adjourn, *sine die.*

The President—Gentlemen, before putting that motion you will permit me to offer you my congratulations upon the successful prosecution and termination of your labors. You have met under circumstances of great responsibility, and I must say, of somewhat great public excitement; you have discharged your duties, I think, faithfully and well.

To the Governor of the State of Illinois, we are under great obligations for the hearty zeal with which he cooperated with the first inception of this movement, which he has carried out with so much earnestness and good will, and we cannot also but feel greatly obliged to him that he has by his presence added so much to the dignity of this convention, through being daily with us and giving to us his countenance and approbation.

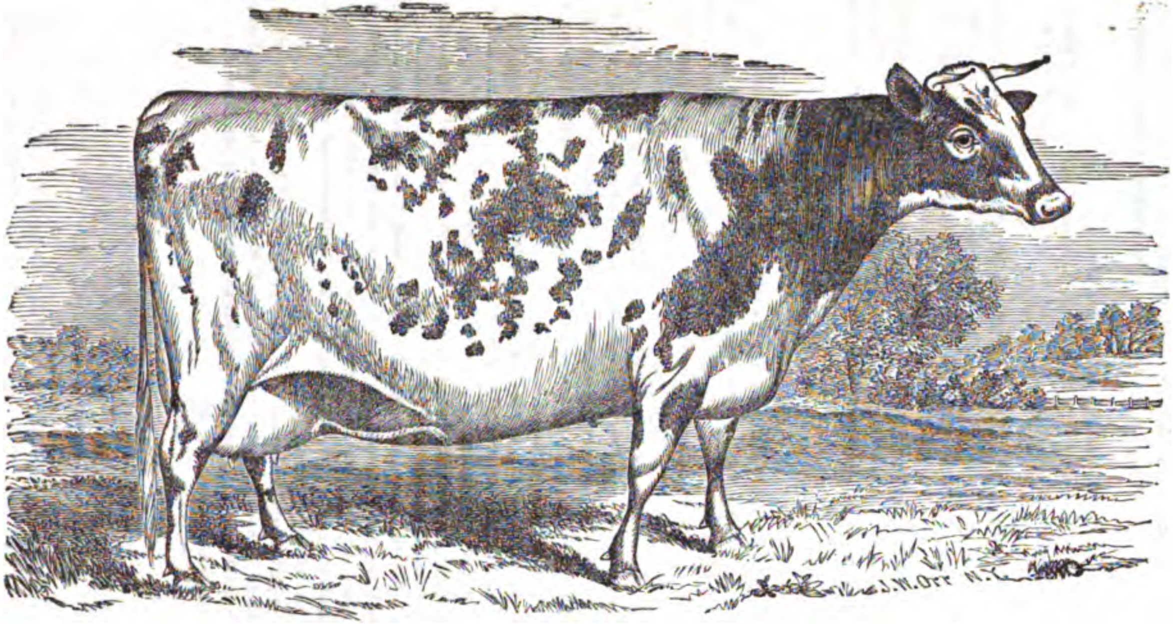
For myself, gentlemen, I feel very highly honored at being elected to preside over a body representing so much wealth and integrity of character as is combined in this convention, wherein so much wisdom and so much executive ability are required at the hands of its presiding officer.

But, so far as regards myself, personally, the best thing that I can do is to tell a story, as was occasionally the habit of the lamented Lincoln.

Some four years ago, before that best of men was foully murdered, I, as an old acquaintance and a great admirer, called to see him. *I did not,* gentlemen, wish to ask him for any office, but merely looked in on him, socially. I congratulated him on the success with which he had managed the affairs of the government, when he, with all the simplicity and artlessness of a child, replied, "Mr. Allen, I have done just as well as I knew how."

Gentlemen, I have done just as well as I know how, while presiding. I feel truly gratified at the confidence you have placed in me and at the hearty vote of thanks you have accorded me. Wishing each and all the utmost measure of prosperity (great applause), I bid you farewell.

The convention now stands adjourned, *sine die.*



AYRSHIRE COW "TIBBIE." Property of Walcott & Campbell, New York Mills, Oneida county, New York.

The above cut is a very correct portrait of the cow "Tibbie," which we have several times seen at New York Mills. She is red and white, and was seven years old last March. The portrait also represents, as well as pencil could be made to do, the true characteristics of a good milch cow. The head is small, nose fine, eyes mild, neck and fore-quarters light rather than heavy, hind-quarters deep, with capacious, square udder, and large milk veins. The Ayrshires are well known as the best representatives of fine milking qualities, and are withal, handsome cattle.

THE DAIRY:

ITS PRODUCTS, METHODS AND PROFITS.

An Address Delivered at the Wisconsin State Fair, Madison, September 30, 1868.

BY X. A. WILLARD, M. A., OF NEW YORK.

Members of the Wisconsin State Agricultural Society, Ladies and Gentlemen :

It is very gratifying for me to be present at this great exhibition of Western industry, and to have the opportunity of addressing a Western audience.

Your Secretary, Dr. Hoyt, when inviting me to speak on this occasion, made special request for a practical address upon the DAIRY.

A practical talk upon any branch of agriculture hardly admits of any attempt at oratorical display. Good taste would seem to dictate that questions upon practical farming should be treated in a plain common sense way. I do not wish to convey the impression that there is no poetry, no romance, no beauty or pleasure in farm life ; for I hold that quite as much of all this may be found in the farmer's calling as in other walks of life ; but when we come down to business and money-making, I am told the people of the Northwest prefer to look at things from that stand point.

I do not know what may be expected of me upon this occasion, but I have assumed that earnest practical men are better satisfied with that which is useful and applicable to their business, although stated in plain language, than with speculative theories, elaborated into rounded periods and eloquent diction.

If I have made a false assumption I cannot expect to hold your attention, since I have counted entirely upon your interest in the questions to be discussed.

There are large tracts of land in Wisconsin adapted to the dairy, and it is a matter which concerns the prosperity of the State, whether this branch of farming promises to be remunerative and enduring. The true dairy lands of America are somewhat limited in extent, and it is believed by many that the time is rapidly approaching, when the demand for dairy products will be largely in excess of production. Last year (1867), though the make both in Europe and America was the largest ever known, it was not beyond a healthy consumptive demand, while the product both of butter and cheese this year—on account of the severe drouth in Great Britain, it is thought, will be much less than what is really needed.

The history of Eastern farming goes to show that no character of farm lands has increased in value in the ratio of that in the dairy districts. I am not prepared to say whether this rule holds good at the West, but the time will come, I apprehend, when the dairy lands of Wisconsin—location and other things being equal—will command the most money.

In making this comparison, farming lands, in the ordinary acceptation of the term, are meant.

Lands covered with hop plantations, with vineyards and orchards, or in the vicinity of cities, when market gardening is in successful operation, owe much of their value to their improvements, and cannot, therefore be counted in the comparison.

It is alleged that the true grazing dairy lands are more valuable than grain lands, because :

1st. They are of more limited extent. 2d. The grasses have fewer enemies to contend with, and give the most reliable results for any series of years. 3d. That dairy farms can be carried on at less expense; that they are constantly increasing in fertility; that the products of the dairy are earlier and more readily turned into cash; that the product of the farm is concentrated into a small compass, and hence the cost of transportation is reduced to the minimum; and, lastly, that an increased and permanent foreign demand renders prices stable, so that the dairy farmer can nearly always count upon the income from his farm.

The Herkimer county, N. Y., farmers claim that there has not been a failure in the grass crop of the county for thirty years—that is, that during that time, there has been no necessity for turning off the herds for want of pasturage, nor the importation of hay or fodder for their winter keep.

For the last twenty years I have had personal observation of the cheese crop of the county, and in no year has it failed, though of course some seasons have been marked as giving below the average yield, but none so markedly poor as to be called a failure.

I have referred to the claim that the labor expense on a dairy farm is less than that for grain. I have known of many instances when one man and one woman have done all the work on a farm carrying 30 cows, except the employment of an additional hand for a couple of months in haying and harvesting.

The more usual course among those who rent farms carrying from 30 to 40 cows, is to hire a man for six or eight months, perhaps a girl for the same time in the house, if the wife is not strong, and cheese making is to be conducted on the farm. I cannot say that this is always the best course, or that more profits might not be secured by a judicious outlay of more manual labor. I only mention the fact to show that an hundred acres in pasture and fifty acres in meadow are managed with less labor than if the same were devoted to other crops than grass.

The average annual receipts on good dairy farms at the East, at present prices of dairy products, are from twenty to twenty-five dollars per acre.

Before proceeding to give in detail, some of the methods found to be successful in dairy practice, it may be well to review in brief the present condition of the cheese interest in this country and Europe. From the figures which I shall present, the farmers of Wisconsin will, I trust, be able to see more clearly what inducements are offered, in turning their attention to this branch of farming.

It is only quite recently that the dairy has become an important branch of national industry. During the past eight years it has been rapidly spreading over new fields. It is engaging the attention of farmers in the Eastern, Western, Northwestern and Middle States, wherever lands are adapted to grazing, and there are springs and streams of living water.

The history of American dairying has never been written. Perhaps a glance at its rise and progress as a speciality, will not be out of place.

Herkimer, New York, is the oldest dairy district in America. I knew the man in his old age who first began cheese dairying in Herkimer. He came into the country on foot from New England more than seventy years ago. He was rich in health and strength. He had eight silver shillings in his pocket, an axe upon his shoulder, and two stout arms to swing it.

Nearly the whole country was then a dense forest. Brant and his Mohawks had been gone several years, but traces of their pillage and murders were fresh among the early settlers in the valley and along the river.

The old Dutch heroine, Mrs. Shell, was then living in the country. She was a noted character during the Revolution. She is represented as having been very comely, with a magnificent figure, and proportion like that depicted in Grecian statues. She had soft brown eyes, and was withal as tender-hearted as she was courageous. Her husband being at the wars, she took her infant to the field, and helped her eldest son, a lad, to hoe the corn, with a musket strapped to her shoulders.

The savages, in more than one encounter, had learned to fear and respect Mrs. Shell. Her aim was steady and her bullets death.

When the Indians besieged her log house, she fought side by side with her husband, all day and all night, battering the guns with an axe as they thrust them through the logs, and firing at the assailants, until help came from the Fort. The house stood on the great black slate hills, rising near the Mohawk, to the north, overlooking a long line of charming scenery. Beyond was a valley, and a still higher elevation. Here the sturdy young New Englander picked his land. His strong arms felled the timber over many acres. He built his log house and established his herd upon the soil. Then he took to wife a Cheshire girl, who made the first cheese dairy in the State. This man's name was Arnold. He accumulated large wealth, and was of the strictest integrity, and went to his rest honored and respected.

From such beginnings sprang the mighty giant, that is now stalking over the continent, dotting the land with countless herds. Perhaps the strength of this interest can best be given in figures:

American dairying now represents a capital of more than $700,000,000. The cheese product last year, (1867,) sold for $25,000,000, and the butter product of New York alone, was nearly 85,000,000 of pounds, and the quantity of cheese made 72,000,000 of pounds. The value of these products, at a very moderate estimate, was then 50,000,000 of dollars.

The wheat crop of New York in 1864, was 6,000,000 of bushels; oats, 19,000,000; rye, 2,000,000; and corn, 17,000,000. The product of New York dairies therefore sold for more than the entire grain crop of the State.

The wool clip of the State that year was not quite 16,000,000 pounds, which at a dollar per pound would amount to no more than one-fourth that from the dairy. There has been a large increase of dairy farming in New York since 1864.

Looking carefully over the census, I fail to find any other agricultural interest in the state that can begin to measure arms with the dairy, for if we add the value of pork made from whey, the calves raised and and the beef and milk sold, we can hardly get the annual product from the dairy farms of New York below an hundred millions of dollars. Am I wrong then in supposing the dairy farmers of New York to be the most powerful body of agriculturists, devoted to a specialty, in that State.

It is remarkable how rapidly this interest has been developed. In 1840, the value of the dairy products of New York, butter, cheese and milk, was estimated by the U. S. census at only $10,496,000, and in all the States at about $34,000,000. In 1850, the product of butter in the United States and Territories was 313,345,306 pounds, and the cheese 105,535,893 pounds. In 1860 the butter product had reached 469,681,372 pounds, and the cheese 103,663,927 pounds. The value of their products that year could not have been less than 200,000,000 of dollars. The total industrial product arising from agriculture within the United States, in 1860, was estimated at about eighteen hundred millions of dollars.

The products of the dairy, then, were one-ninth of the total agricultural products of the whole country.

The cotton crop of 1859 was 4,850,000 bales, worth $242,500,000—not very much more, it will be seen, than the value of the products from the dairy.

It requires nearly all our agricultural labor in the Northern States to feed our mouths. In 1865 we exported only 8,000,000 bushels of corn out of nearly 800,000,000 bushels raised, and the same proportion of wheat and all our other agricultural products. We cultivate now about 31,000,000 acres of corn and 11,000,000 acres of wheat.

The transport of wheat and corn from the Northwest to the sea-board, and the freight across the Atlantic, renders it difficult to compete with European grain-growers in their own markets.

Hence turning the corn into butter, cheese, beef and bacon, or any system of agriculture by which you can condense a bulk product, and reduce freight, must be advantageous to the Western farmer. But the great West, so rich in soil and in almost every agricultural product, is as yet unable to supply itself with the products of the dairy.

If you can afford to purchase cheese from New York dairy farms which are selling from one hundred to two hundred dollars per acre, paying for the transport of the article West, it would seem at least that you have plenty of money, (which of course we are willing to take) though, to tell the truth we think it rather extravagant on your part.

From the best information we can get, the cheese product of 1867, from the whole dairy district of the United States, amounted to 200,000,000 of pounds. Nearly half of this product was made in the State of New York.

Between 1840 and 1850 American cheese began to be shipped abroad, the first shipment having been inaugurated by Herkimer county dealers.

In 1848–49 the exports of American cheese to Great Britain, were a little over 15,000,000 of pounds. Much of the cheese manufactured that year was poor in quality and British shippers claimed to have sustained heavy losses. There was a more moderate demand the following year, and prices fell off a penny a pound, varying for fair to strictly prime from 6 cts. to 6¾ per pound.

The exports of 1849–50 were 12,000,000 pounds, and continued to vary without important increase for several years.

In 1860 the exports had reached 23,000,000 pounds, and were increased the following year to 40,000,000 pounds. About this time the associated dairy system began to attract attention. Several factories were in operation in Oneida County, N. Y., and were turning out a superior article of cheese. The system had first been inaugurated by Jesse Williams, a farmer living near Rome, in that county, and was suggested from mere accidental circumstances. Mr. Williams was an experienced and skillful cheese-maker, and at a time when the bulk of American cheese was poor.—His dairy, therefore, enjoyed a high reputation and was eagerly sought for by dealers. In the spring of 1851, one of his sons having married, entered upon farming on his own account, and the father contracted the cheese made upon both farms at seven cents a pound, a figure considerably higher than was being offered for other dairies in that vicinity. When the contract was made known to the son, he expressed great doubt as to whether he should be able to manufacture the character of cheese that would be accepted under the contract. He had never taken charge of the manufacture of cheese while at home, and never having given the subject that close attention which it necessarily required, he felt that his success in coming up to the required standard would be a mere matter of chance. His father, therefore, proposed coming daily upon the farm and giving the cheese-making a portion of his immediate supervision. But this would be very inconvenient, and while devising means to meet the difficulties and secure the benefit of the contract, which was more than ordinarily good, the idea was suggested that the son should deliver the milk from his herd daily at the father's milk house. From this thought sprang the idea of uniting the milk from several dairies, and manufacturing it at one place. Buildings were erected and fitted up with apparatus, which, proving a success, thus gave birth to the associated system of dairying, now widely extended throughout the Northern States.

This system, during the last eight years, has been carried into the New England states and into the Canadas. It is largely adopted in Ohio, and has obtained a foothold in Wisconsin, Illinois, Iowa, Kansas, and other states. It is known abroad as the "American system of dairying," and its peculiarities are so well adapted to the genius of our people, as to give it a distinctive character of nationality.

At the commencement of 1860, there were but seventeen factories in the state of New York.—They were increased during the next six years to 500, and it has been estimated that there are now about 800 in the state. In Wisconsin there are less than a dozen factories, and the whole gross product of your dairies, if in New York city at once, would scarcely supply the shippers with one week's shipment.

Last year I, with many other New York dairymen, feared that the cheese interest was being overdone. Prices were quite unsatisfactory. The cost of cows ranged from $70 to $100, Labor was high and we had to pay for Wisconsin flour from $15 to $17 per barrel. We had been accustomed to exchange at our doors 40 pounds of cheese for a barrel of your flour.

. The speculators made a hue and cry that the country was full of cheese, that the whole West had sprung into the dairy business, and that you were prepared to ship immense quantities to the seaboard, flooding all the markets of the world, and so our dairymen yielded to low prices, and England was in ecstacies. When the year's operations were summed up, we found there had been no over production and instead of Western cheese coming East, considerable quantities of New York cheese had been shipped West.

THE EXPORTS.

We have given the exports of cheese in 1861 at 40,000,000 pounds; in 1862 the exports were, in round numbers, cheese 39,000,000 of pounds, and butter 29,000,000; in 1863, cheese 41,000,000, and butter 23,000,000; in 1864 cheese 46,000,000, and butter 14,000,000; in 1865, cheese 46,000,000, and butter 22,000,000; in 1866, cheese 45,000,000, and butter 5,000,000. For the past year, 1867, the exports of cheese were about 55,000,000 of pounds,

ENGLISH PRODUCTION AND IMPORTS FROM HOLLAND.

According to the estimate of the English shipper, Mr. Webb, the product of cheese made in Great Britain the past year, 1867, has been 179,000,000 of pounds. We have no estimate of the quantity of cheese made in Holland.

In 1866 I was in Europe, and obtained for the American Dairymen's Association the quantity of Dutch cheese sent to England that year; it was 80,000,000 of pounds. An approximate estimate of the annual consumption of cheese in Great Britain may be gathered from the following figures:

English home make	179,000,000
Import from Holland	80,000,000
From the U. S	50,000,000
Making the total English consumption	309,000,000

of pounds per year.

CHEESE CONSUMPTION, &C.

I have said that fears had been entertained that we had reached the limit of over-production. Time must, of course, decide this question, but in the meanwhile a knowledge of the ordinary consumption of cheese in the United States and Great Britain, may be a help on which to base future operations.

From careful estimates it appears that the consumption of cheese in the United States and Canada is annually about 160,000,000 of pounds. This makes 469,000,000 of pounds, as the consumption demand in Great Britain and America.

Against this we have the product of cheese made in Great Britain	179,000,000
Product of the United States	200,000,000
Product of Canada	15,000,000
Total	394,000,000

Quantity lacking to supply two nations beyond the home make, 75,000,000 of pounds.

Mr. Webb informs us that France has become a competitor with England for Dutch cheese, and that hereafter the imports into Great Britain from this source must decrease. On the other hand Sweden is entering the field as a dairy district, and will compete hereafter with the United States in the English markets.

Already the Swedes are turning their attention to the factory system, and during the past season occasional samples have out-sold, it is said, the finest grades of American in the English market.

Some of the leading men at the South are proposing to try the dairy in various locations. A cheese factory is already in operation in Kentucky, Missouri, North Carolina, Virginia and Tennessee; but many question whether the dairy can be successfully carried into warm climates.

In regard to the quantity needed abroad, Mr. Downes, Secretary of the London Board of Trade, writes me in a recent letter, that Americans should bear in mind this fact—the population of Great Britain doubles every forty years, and that the consumptive demand for cheese is in proportion to the increase of population. On the assumption that Great Britain doubles her population in forty years, the ratio of her increased cheese consumption would be 10,000,000 of pounds annually.—Then, if the United States doubles its population in twenty years, the ratio of increased consumption would be 8,000,000 of pounds per year, making 18,000,000 of pounds as the annual increase of consumption for the two nations.

It may well be doubted whether the production of cheese will keep pace with this demand, since the increased demand for and consumption of butter goes on in the same rapid proportion.—I think it may be safely estimated, therefore, that this branch of farming promises to be enduring and remunerative, if the people continue their efforts to improve the quality of both butter and cheese.

NUTRITIOUS QUALITIES OF BUTTER AND CHEESE.

There is another question in regard to the products of the dairy, upon which people generally have very loose notions. The common impression among consumers is, that butter is more nutritive than cheese—that cheese is an article of mere luxury, and therefore cannot be classed among the economical articles of food. This is a great mistake, which the English laborer obliged to economize in his food, has long since discovered. The English laborer often lives months without any other animal food than cheese. He will endure the most exhaustive labor on bread, cheese and ale.

Americans generally have very little conception of the vast consumption of cheese in Great Britain by all classes, the rich as well as the poor. And this assumption is founded upon correct principles of health, nutrition and economy. Recent writers affirm that nitrogenized foods are alone capable of conversion into blood and of forming organized tissues—that, in fact, they are the foods properly so called. The non-nitrogenized foods, of which butter or fat are one, are pronounced incapable of transformation into blood, and are, therefore, unfitted for forming original or living tissues. They are, nevertheless, essential to health, and Liebig asserts that their function is to support the process of respiration, (by yielding carbon and hydrogen, the oxygenation of which is attended with the development of heat), and some of them, he states, contributed to the formation of fat. These non-nitrogenized foods he calls elements of respiration. They consist of fat, starch, gum, cane-sugar, grape-sugar, sugar of milk, pectine, bassorine, wine, beer and spirit

The nitrogenized foods, or plastic elements of nutrition, are vegetable fibrin, albumen, casein, animal flesh and blood. It has been found by experiment in animals, that gum, sugar, starch or butter, cannot alone preserve the health or life of animals. Magendie found that dogs fed exclusively on sugar and water died in from thirty-one to thirty-four days, and similar results were obtained with butter and gum. Tiedemann and Gmelin have confirmed Magendie's statement.

In the report of the Gelatine Commission of the French Academy of Sciences, it is stated that a dog fed on French butter only, continued to eat it irregularly sixty-eight days. He died subsequently of inanition, though in a remarkable state of *embonpoint*. During the whole experiment he exhaled a strong odor of butyric acid, his hair felt greasy, and his skin felt unctuous and was covered with a fatty layer. At the autopsy all the tissues and organs were found infiltrated with fat. The liver was in a state called in pathological anatomy, *fatty*. By analysis, a very large quantity of stearin (margarine) but little or no olein, was found in it. Into this organ therefore there had been a kind of infiltration of fat. Non-nitrogenized foods support the process of respiration by yielding carbon, and in some cases hydrogen to be burnt in the lungs, and thereby to keep up the animal temperature. This is the reason why fatty foods are relished, and are even necessary in cold climates, and also why they are repulsive to persons living in the torrid zone, when heat is supplied to excess by climate.

It will be seen therefore that casein (the leading constituent in cheese) is the chief nitrogenized constituent in milk. It is highly nutritious, and it is from this source that the development of the tissues is effected in young animals which feed upon it. "The young animal," says Liebig, "received in the form of casein (which is distinguished from fibrin and albumen by its great solubility, and by not coagulating when heated) the chief constituents of the mother's blood. To convert casein into blood no foreign substance is required, and in the converting of the mother's blood into casein, no elements of the constituents of the blood have been separated. When chemically examined, casein is found to contain a much larger proportion of the earth of bones than blood, and that in a very soluble form, capable of reaching every part of the body.

Thus even in the earliest period of its life the development of the organs in which vitality reside, is in the carnivorous animals, dependent upon the supply of a substance identified in organic composition with the chief constituents of its blood."

These facts have been alluded to because there is a misapprehension generally in the minds of the people in regard to the nutritive properties of cheese. It is considered to a great extent as a mere luxury, when the facts show that there is no article of food in common use that is so nutritious.

Professor Johnson states that a pound of cheese is more nutritive than two pounds of beef, and as it contains no bones and scarcely any waste, and is readily substituted for meat, always ready for the table, requiring no cooking, easily transported, and preserved for long periods, a luxury as well as a healthful and useful article of food, it deserves to enter very largely into the consumption of a people.

When the Americans begin rightly to understand that a pound of fine cheese instead of being a mere luxury, is at the same time twice as nutritious as an equal weight of steak for which we at the East are paying from 18c to 25c per pound, they will understand as the English do, that its use is economical, and demand the utmost production that the country can give.

DAIRYING AS A SPECIALTY.

But suppose we have resolved to enter upon this branch of farming, will it be best to make it the sole business of the farm to the exclusion of other branches? This question has been fully discussed and pretty effectually tested in practice, through the old dairy districts of New York.

A few years ago, the dairymen of Herkimer insisted that the dairy alone was more remunerative than other kinds of farming, and hence it was not worth while to devote attention to other branches. The area of pastures and meadows was spread to their utmost limit. They were plowed only when necessity compelled, and then speedily returned to grass. Even the breeding and raising of stock were neglected, and the herds largely made up by importing cattle from non-dairying districts. So strongly did this single specialty system impress the mind, that butter manufacture was abandoned, so far as it could be, and every effort made to work up all the cream into the cheese. The best manufacturers in the country, the English shippers, and the great army of cheese dealers, insisted that fine cheese demanded the largest amount of cream, and that the richer the milk the better the cheese. I was the first to assail this principle and show it to be fallacious. I showed from actual experiment—from chemical analysis—from the whey vats of factories covered with cream almost thick enough to bear a man, that fine cheese did not depend altogether upon the amount of butter in its composition. So prejudiced are people who have been long engaged in a specialty, and educated up to a certain notion, that I doubt whether the dairymen of New York could have been induced to entertain the least respect for such teaching, had not the said process in cheese-making, which I had some years before introduced, proved correct and became generally adopted, saving to the country millions of dollars.

Perhaps a word of explanation should be given in regard to this so-called acid process. Up to 1854, the cheese of America was manufactured by processes having no fixed principles. The thermometer for testing the heat in the various manipulations was only in occasional use. The impression universally prevailed that the milk, the curds, and the whey, during the whole process of manipulation and manufacture, should be kept perfectly sweet. Any perceptible acidity developed by accident during the process was regarded by cheese makers as a calamity entailing losses. As a consequence the great bulk of American cheese was soft, spongy, extremely liable to get out of flavor, quick of decay, and of no character in the English market, except as poor, bad, and indifferent. Immense losses were from time to time made by the dealers handling it, and although some prime dairies were made by those who had had a life-long experience, they were not able to explain the principles by which their success was attained. I had been experimenting in milk, with a view of fixing upon some different stand-point as a guide in cheese making. Instead of guessing at temperature by introducing the hand into the vat, the range of heat securing the best results was marked by the mercury. From this point the changes in the process became a study, and the fact soon made itself apparent that cheese making was purely a chemical process; that it was better to develop further chemical change in the vats, while the curds could be under immediate observation and control, than to trust the necessary changes and transformation, to be perfected after they were put to press, or carried to the cheese-room. I found that by the use of acid (sharp, sour whey) in the milk, or by allowing the curds and whey to stand until acidity was developed to a certain point, the watery portions of the milk were more easily expelled, and the curds assumed a more solid texture, while flavor, mellowness, and flakiness could be more easily secured.

It took much writing and much talking to introduce this system among American cheese manufacturers, and perhaps it never would have been introduced, had not the cheese made by a few experimentors, trying this process, been sought after and commanded extraordinary prices. It was not until the factories began to understand and practice this principle, that American cheese took character in the European market; and the wonderful development of the dairy interest, has been due not wholly to the factory system, but to the fine character of goods which they manufacture. The English Cheddar process is similar in principle. I shall refer to it further on.

But to return to the question. I think our dairy farmers made a mistake in their exclusive devotion to one single branch, and that a mixed agriculture, making the dairy the leading branch, would have given better results. The English dairymen in the great dairy districts in the west of England devote but little land to meadows. They grow wheat, barley and other grains. They produce wool, mutton and beef. The herds in winter are fed upon chopped straw, with the addition of oil cake, bran and coarse grains. Large profits are thus realized and the land kept in a high state of fertility. Some of the Herkimer county farmers are beginning to adopt this system with success. Our soil is tenacious and more difficult to be worked than yours, but it yields large crops of wheat, barley, oats and corn. Some carry a few acres of hops, but this is not generally to be recommended, as hops are an uncertain crop, variable in price and rob the farmer of the manures. Fruit culture when it can be successfully conducted is better. One of my neighbors in an adjoining town has 5,000 pear trees just coming into bearing and the profits from this source must soon be large, as the fruit sells readily at from $5 to $8 per barrel.

To you, in Wisconsin, where grain can be raised with more facility than with us, the system of mixed husbandry in connection with the dairy, it would seem, must result in the most profit. Then if you abandon the use of the "scrub native cow," and adopt the English system of selecting animals that will readily fatten, and turn them as they do into beef before they become old and worn out; your coarse grains, your bran and ship stuffs, it seems to me, if fed up and converted into milk, beef and bacon, must bring more money than to ship them to eastern markets.

BREEDING STOCK FOR THE DAIRY.

A great many writers urge upon dairymen the breeding of a race of cattle for *milk alone*. Mr. Fish, of Herkimer, experimented in that way. He improved his herd so that it averaged a yield of between 800 and 900 pounds of cheese per cow, but the constitution of the animals became so impaired and weakened, that it did not prove profitable. Cows that will yield 590 to 600 pounds of cheese and then can be easily made ready for the butcher, are all that we should ask. Milch cows are liable to many accidents; some prove inferior for the dairy, lose a portion of the udder, fail in milk easily or run farrow. Such animals, if of a breed will fatten readily, can be cheaply turned into beef, and if they have not proved profitable for the dairy are made to pay a profit for the shambles.

ENGLISH CHEESE-MAKING.

I went out to Europe in 1866, for the American Dairymen's Association, and examined the different methods of cheese-making in England.

English shippers were constantly boasting of the superiority of English cheese, and could not afford, they said, to pay for American the same price.

No practical works on English cheese making could be had, and none has been written that is considered of any value by English dairymen. It has happened that the good writers are not cheese makers, and the cheese makers are not good writers. Besides, the English dairymen are opposed to having all the secrets of this art printed. But again, there is not a cheese maker living that can explain on paper all the mysteries of his art, nor is there one that can always handle milk so as to avoid difficulties and an occasional inferior product.

The most celebrated chemists are unable to explain correctly the nature of rennet—the coagulating principle used in cheese manufacture. The cheese maker must not therefore rely wholly on a mere set of rules, he must understand principles. I found various processes in operation in the various shires or counties. In all these, *excepting the* CHEDDAR *process,* I was greatly disappointed. The Cheshire, the Wiltshire, the Double and Single Gloster and other methods are defective and extremely laborious. The implements are outlandish, and belong to a past age of the world. The dairy people in the different districts, are tenacious of their practice, and adhere to it with a dogged pertinacity, notwithstanding the Cheddar dairymen, under their improved system, are beating them in the markets from 10s to 30s sterling the hundred weight. Much of their cheese is manufactured by guess, and varies in character according to the skill and experience of the dairymaid. There is scarcely a thing in any of these processes (the Cheddar excepted) that would be of any service to us, and if introduced here, would be a positive damage. American cheese is richer and better made, and is acknowledged by the best judges in Great Britain to surpass in every respect these styles as they are commonly made. The Cheddar, however, is a very high character of English cheese, and commands a very high price. Its good qualities have not been overrated. Their best samples have rarely been equalled and *never surpassed in American dairies.* The quantity made is comparatively small. It takes its name from a small village at the foot of the Mendip hills in Somerset county, its manufacture there having been commenced more than a hundred years ago.

Various improvements have been made in the process, until it has been reduced to a system, which is at once simple and philosophical. It may be said to be a chemical process, requiring skill and judgment in the management of acids, until the curd has passed through its different stages, and is properly developed for the press. Its leading principles are similar to those now practiced by our best cheese makers, and it is due to them that American cheese has been able to obtain such a firm foothold in the English market. The early expulsion of the whey in the English process, together with the exposure, of the curd a longer time to the atmosphere, the pressing, grinding and saltings are doubtless improvements upon our practice. I need not go into detail upon these points; they have been fully explained in my recent address before the American Dairymen's Association, but I allude to them here that proper credit may be given to English Dairymen. I must say this also, in their favor: nothing while abroad struck me with more force, and admiration, than the perfect neatness and cleanliness of the dairy. The milk rooms are located beyond the reach of bad odors likely to taint the milk. They have stone floors, the joints nicely cemented together, so that no slops or putrid matter can find an entrance. The floors, the utensils and everything connected with the establishment are as bright, clean and sweet as the table and crockery of the most fastidious. Many of the farmers will not allow the milkers to come into the milk room, but have conductors by which the milk is conveyed to the tubs from the outside.

It is this perfect cleanliness of the dairy together with the favorable condition of the climate and a more uniform temperature of curing rooms, that enables them to secure that mild pure flavor, which is characteristic of some of the nice grades of cheese.

The best American cheese, has more butter in its composition, and is better manufactured as a whole than the English.

The great defect in much of our cheese is its flavor. We have a hot bad climate to contend with; we are too careless in milking and in handling the milk, when taints can be absorbed. We put the warm milk in cans confining it with a close fitting cover, and haul it a long distance in a blazing sun to the factory and it is often in a putrid condition before going to the vats. What wonder, then, that much of our cheese rich in butter and splendidly manufactured is out of flavor and vast sums in consequence are lost.

American dairymen have been trying for years to discover wherein this defect of flavor can be remedied. A great deal of time has been spent in the investigation of the subject, and a great many theories suggested, but it has all amounted to nothing. From my observations, both at home and abroad, I am convinced that first principles have been overlooked; that factories have been trying to make a finely flavored cheese from imperfect milk, a condition which manufacturers never have been and never will be able to accomplish. A reformation must be had in securing clean and perfectly pure milk together with better curing rooms; and then under our improved system, American cheese will stand, where our nice grades already do, as the richest and finest that the world produces.

I went up to see the Royal Dairy at Windsor, and if every dairyman in America could go there, he would come back with greatly improved views in regard to the importance of cleanliness in dairy practice.

PRINCE ALBERT'S MODEL FARM AND THE ROYAL DAIRY.

The model farm and dairy is but a short drive from the royal palace, and is exceedingly interesting to one who has a taste for farming. The cluster of farm buildings, including that for the steam engine, stand together and are brick. The whole yard as well as the alleys are paved with stone. Under one of the long sheds were arranged the various machines for preparing the ground for the crops, and in another building the machines for harvesting crops. The stalls for horses and cattle are arranged quite differently from ours in New York. The buildings are rather sheds than barns, being one story and divided into compartments, each having an open arch-way leading into an inclosure of the yard. One or two horses occupy each compartment, where they have liberty to be either under cover or in the liittle division of the yard adjoining the stall or box, which is fenced with iron railings. The cattle stalls are arranged in the same way. Each stall has feeding boxes and a tank of water in the same range, and in front of which there is a broad alley on a level with the feed box, where persons in charge can deliver the food or pass down and see that all is right. Every part of the yards and buildings has stone pavements and floors, with gutters for conducting off the liquid manures, so that there shall be no waste. Straw is used exclusively for bedding, or to be tramped up for manure. In one of the stalls were some fine specimens of cattle from India.

THE ROYAL DAIRY.

The dairy buildings stand apart, and are at some distance from the farm buildings. The dairy house is a beautiful structure of brick, with cupalo and pointed roof; its outward appearance having a pleasing effect. The interior, however, is beyond question all that is neat and tasteful in dairy decorations. The floor, the walks, and the ceiling are of biscuit tile, fashioned after the most graceful designs. The pans for holding the milk are of white porcelain, with a heavy line of gilt around the edge. They are elliptical in shape, with a nose or scallop at one end for emptying the milk. They stand upon broad, white marble slabs highly polished. The windows are of stained glass, and on each side of the room are fountains of china, arranged with unique figures and graceful devices. Tiny jets of water spin up from these and fall into the china basins with a musical ripple. The ceiling has open spaces arranged to represent mosaic work, and there are three compartments between the ceiling and the roof so as to secure perfect ventilation. All about the sides of the room are medallion heads of the Royal family elegantly pictured in china, and the whole reminds one of the charming descriptions of fairy life which he read in childhood.

BUTTER MAKING AND IMPLEMENTS AT THE ROYAL DAIRY.

It was three o'clock, and the milkers were bringing in the milk, which is strained in an adjoining room. It is then placed upon the marble slabs, and the cream is taken off when the milk has stood twenty-four hours. In twelve hours after it is skimmed again.

The cream is churned when forty-eight hours old, the churning being performed in an adjoining room. The churn is of tin, barrel-shaped, and revolving. It has compartments at each end for hot or cold water, so that the temperature can be regulated without mingling water with the cream. The butter is washed in an oval tub, unpainted, and after being washed is worked upon two thin wooden paddles.

The cream and milk for the royal tables are put in small tin cans with covers, and these again are placed in a larger tin receptacle with cover, when they are sent away to the Palace, either to London or the Castle, as the case may be, where the Queen is staying. The butter and milk had a purity and sweetness of flavor that could not be surpassed.

CLEANLINESS. TIN PAILS FOR MILKING.

In new sections where the dairy is being established, it is important to start with correct principles. The old districts have much to unlearn, and unless they speedily change some of their practices, they will be outdone by the new districts which are making greater exertions for success. The old wooden pail as a milk pail is a nuisance, and its use entails thousands of dollars loss to the dairy interest. I urged the use of tin pails for milking at our Convention, more than three years ago, and suggested how they should be made. They should have concave bottoms with no sharp corners where milk can lodge and be difficult to cleanse. They should have a narrow rim upon the top turning over so as to slip down nicely, fitting into a wooden pail, which should encase it for protection. Every factory should urge upon its patrons, the use of the tin dairy pails. It is just now beginning to be adopted in the old districts, and must come into general use, because it is so difficult to keep wooden pails clean, that even the most scrupulously neat often fail to do so. It is wonderful what a small quantity of ferment, will taint a large quantity of milk. The accumulation of old and decomposed particles about the sides and corners of a wooden pail, communicates its poison to the good milk and sets it into a ferment, which the cheese maker is often unable to control. Painted pails are objectionable because the paint imparts its taint and poison to the cheese.

I have alluded to cleanliness in milking and about the dairy, as an important element in securing good flavor in cheese, and it cannot be urged too strongly upon your attention. The feeding of swine at factories, unless far removed from the buildings, cannot be recommended. Some of our new factories in Oneida have entirely banished them from the premises, and the whey is taken home by patrons. I have seen some of these factories, where everything is kept sweet and clean, both at the factory and among patrons, and the cheese made is becoming noted for its delicate flavor. These questions are just beginning to be understood and appreciated by dairymen, and you will do well to profit by that which we have been so long in learning.

RECENT IMPROVEMENTS IN FACTORY BUILDINGS, ETC.

In the arrangement and fitting up of factories, some important improvements are now being introduced. Substitutes for steam engine and boiler are being tested. One of the devices recently brought out, is an arrangement of gas pipes set in a furnace, upon which the fire comes in direct contact, heating the water by this means. Another device just put in operation, is a nest of hollow cast iron boxes, connected by pipes, and set in a brick furnace, the fires applied underneath. Mr. Sears, of Madison county, who owns two factories, has taken out his steam engine and has tested this contrivance. He says they are the most perfect heaters that have yet been invented, and that he would not use an engine if furnished without cost. This new heater only costs $750 for a large factory; it is simple, substantial, and gives perfect control of temperature. In a test at his factory, of the wood consumed, he finds that three-fourths of a cord of three foot wood will manufacture 12,000 pounds of cheese. The placing of the sinks below the vats, by which the whole mass of whey and curds may run out of the vats through a chute at one end, is another labor-saving appliance. There are machines for cooling the milk in the vats at night, and preventing the cream from rising, operated by clock work, and by waste water from the vats. The application of wind for raising water to supply factories has been found to work satisfactorily.

Then there are two processes for extracting butter from whey, which are claimed to make good, marketable butter, adding largely to the receipts of the factory. The curd mill, though long in use in England, is now just beginning to be introduced in America, and with the best results. Its use is not only a saving of labor, but it improves the texture of cheese, rendering it more compact or less porous. In the Cheddar process, the curds are put in the hoops and pressed ten minutes, then taken out, ground in the curd mill, and then salted. This is, I think, an improvement upon our process, and should at once be adopted. By it you get a more uniform distribution of the salt, and know precisely what is being done, because the curd is uniformy drier, and the salt is not carried out in the whey, as in our process. It is claimed, too, that by salting before pressure, and while the curd is not sufficiently cool, the salt has the effect of forming a shining, tough pellicle about the particles of curd, not only enclosing whey or moisture, but on account of which the union is less perfect, and the cheese in consequence less compact. Again, the Cheddar dairymen, as soon as they can begin to distinguish an acid condition of the whey, immediately commence drawing it from the vat and allow the acid to further develop itself in the curd spread out, or heaped up in the vat or sink. This, I think, is another important improvement, which should be adopted at the factories. It is very difficult to regulate the final conditions of the curd, under all circumstances in the whey. The acid is often pushed forward upon the curd too rapidly, especially in hot and sultry weather. Then if there be taints in the milk, the longer the curd is steeped in the whey, the more distinct and marked they will be in the cheese; but if you get rid of it early, there is more hope of preserving clear flavor, since every moment the whey stands under the influence of heat and decomposition, the stronger becomes its odor and taint, as every practical cheese maker has observed. It is to be doubted whether an uniform fine flavor can be maintained under all the variable conditions of milk, unless this principle is recognized. At any rate under this process, there is less difficulty in obtaining desirable results.

There is another suggestion in regard to rennet and annotto which is not understood, even by our oldest and best cheese makers. At many of the factories great complaints are made that the rennets are weak, and extraordinary large quantities are used at heavy expense. It is true there is great difference in the strength of rennets, and the quantities of milk they will coagulate, but the trouble is often aggravated by not properly understanding the strength of the materials employed. The annotto commonly used is cut by potash, a powerful alkali. Rennet is an acid, or at least its action is similar, and is directly opposite that of an alkali. The one neutralizes the other. Now, if annotto is cut with a very strong lye, or a strong solution of potash when it is added to the milk, it neutralizes or destroys the effect of a large quantity of rennet. Hence the annotto should always be cut with as weak a solution of potash or lye as is possible to dissolve it.

UTILIZING WHEY.

The utilizing of whey from factories has received considerable attention, and various suggestions have been made as to its value and most profitable employment. Its analysis shows that it is too valuable to be thrown away, Some contend that it can be turned to the most profit when fed to cows, while others stoutly affirm that more can be realized from it as food for hogs.

While in England I was told by the dairy farmers (and it was confirmed by the provision dealers in London), that a very superior quality of pork was made by feeding whey mingled with barley meal; that, in fact, no bacon was equal to it in delicacy of flavor, and that it sold for most money in the market.

Of the solid constituents of whey, the sugar of milk is in the largest proportion, being very much in the same ratio that it is in the milk. Some effort, it would seem, ought to be made with a view of extracting this material for commerce. The milk sugar that we find at the shops is imported from Switzerland, and is retailed at one dollar per pound. An estimate has been made of the annual yield of sugar from thirty factories, averaging 400 cows each, and it amounts to the enormous quantity of two millions of pounds, or 10,000 barrels; but, suppose the price is only ten cents per pound, then a factory of a thousand cows, on the above estimate, would yield 800 pounds of sugar per day, which would amount to $80, or $2,400 per month.

When in London, I had some conversation with Prof. Voelcker, the great chemist of the Royal Agricultural Society, on this subject, and he was surprised that no effort had been made by the American factories to turn this constituent of the whey to account, since the large quantities of milk received at one point made it more feasible than where the milk was scattered over the country and worked up in family dairies. Good milk contains from 8 to 9 per cent. of butter and casein, and 5 per cent. of milk sugar. The analysis of whey shows that it yields 4½ per cent. of milk sugar, or half as much weight as the butter and casein of the milk combined.

In Switzerland, milk sugar is made by allowing the whey to trickle down the sides of the mountains in wooden gutters or troughs. Threads are placed in the gutters, upon which the sugar adheres, as the watery portions pass off in evaporation.

It must be evident that the source of income from the dairy would be very much increased could some practical and inexpensive method be invented to take this article from the whey. Whether evaporating pans could be constructed, and heat used profitably in securing this object is a question for investigation; and it seems to me that agricultural societies might profitably employ some chemist to make the proper experiments. If every factory would contribute fifty cents each, good talent could be secured for such an investigation, and a report upon it, even if it amounted to nothing practical, would in many ways be valuable to science.

SOME OF THE PRINCIPLES TO BE OBSERVED IN CHEESE MAKING.

In summing up the question of cheese manufacture, I have only time to notice some of the leading principles that are essential to success. And the first is good clean milk from healthy cows, well fed and well cared for. 2d. Studying the condition of the milk, and understanding that condition before operations commence. 3d. Setting the milk to coagulate at a temperature from 72° to 82°. 4th. In subsequent operations increasing temperature slowly and on no account raising it above 98° to 100°. 5th. Drawing the whey early at the commencement of any perceptible acidity. 6th. Exposing the curd to the atmosphere, and allowing it to fully perfect its acidity after the whey is drawn. 7th. Putting to press before salting, at a temperature of 60° to 65°. 8th. Grinding in a curd mill, and then salting.

BUTTER MAKING.

I fear I have detained you too long, but my address would seem incomplete without a brief reference to butter making. It has always seemed extraordinary to me that there are so few good butter makers in the country, when the article enters into such large and universal consumption, and when there is such a great desire on the part of consumers to obtain that which is good.

Butter making is not so difficult as cheese making. Any one can make good butter that is neat and cleanly, by understanding and practicing a few principles. The greatest mystery about it is to know how to set the milk and get up the cream properly. Cream that rises in uneven temperatures, in bad atmospheres, where it can absorb the gases from decaying vegetable or the many intolerable stenches often in the neighborhood of the milk room, cannot be expected to make good butter, though *churned and packed by an angel.* We make a great deal of poor butter in New York; it is sold under the name of grease. I suppose there may be occasionally a *little* poor butter made in Wisconsin. At the Belvidere Convention, last winter, they told me *some* bad butter was made in Illinois; I have tasted a vast deal of it wherever I have traveled—at hotels and upon tables of all classes of people. Good butter is a luxury—poor butter an unmitigated nuisance.

In my tour through Great Britain, I took some pains to examine this subject and compare butter making abroad with the recent American system inaugurated in Orange county, New York.

The butter product of Orange has long held high reputation, but the new system was first inaugurated there only a few years ago. I went down to Orange county, to study this system on its first introduction in the country. I was induced to make the examination by noticing in the market reports, Orange county pails at 70 cents per pound, while our best grades in Central New York were selling at scarcely above half that price.

On my return an elaborate report was made, explaining the system to the dairy public. Subsequently the New York State Agricultural Society employed me to embody my observations in a pamphlet, which was published by the State, and illustrated with numerous plans and drawings. The system has attracted attention in this country and in Europe. It has proved a great success, and is being introduced throughout the dairy region. There is no doubt but that it is a decided advance over all previous systems, and this opinion is the result of considerable observation over the butter districts of Europe and America. What really distinguishes the American system is in setting the milk so as to secure an even temperature and in applying to butter making the principles of association so that the highest skill in manufacturing may be obtained; in other words the inauguration of

BUTTER FACTORIES.

In the butter factories the milk room is constructed so that good ventilation is secured. It is provided with tanks for holding water. These should be sunk in the earth in order to secure a more uniform temperature of water, as well as for convenience in handling the milk. The vats should be about six feet wide and from twelve to twenty feet long, arranged for a depth of eighteen inches of water. There should be a constant flow of water in and out of the vats, so as to secure a uniform temperature of the milk, after it has been divested of its animal heat. The milk is set in tin pails, eight inches in diameter, by twenty inches long, each holding about fifteen quarts of milk. As fast as the milk is delivered, the pails are filled to the depth of seventeen inches and plunged in the water, care being taken that the water comes up even with, or a little above the milk in the pails. The temperature of the water should be 48° to 56°. A vat holding 2,000 quarts of milk, should have a sufficient flow of water to divest the milk of its animal heat in less than an hour. Milk that is cooled in this way throws up its cream rapidly, and the even uniform temperature in rising the cream, operates favorably when it goes to the churn, the butter coming solid and of good color. Good pure milk when put in the vat in this way will keep sweet for thirty-six hours, even in the hottest weather. The cream should be taken off before the milk sours, and it will nearly all come up in twenty-four hours. The old notion that cream cannot rise through a depth of milk greater than seven inches is an egregious error. The Orange county dairymen get as much cream when set in this way as in shallow pans.

One of the troubles in butter making after the old system is, in regulating the temperature of the milk-room, and in knowing when to skim. In our variable climate it is almost impossible to keep the milk at an uniform temperature when set in pans in the ordinary way. By the new system we always have an uniform temperature without trouble, and, therefore, have perfect control of the milk. Again, under the new system the shells of casein enclosing the butter globules are not so liable to be decomposed and injure the flavor of the butter, for it is this caseinous matter that spoils the butter, and even under the best management it cannot all be taken out.

The Orange County butter makers have tried a great many patent churns, and they find none they like so well as the old fashioned barrel dash churn. They use the barrel and half-sized dasher and in churning, put in about fifty quarts of cream. This is diluted with water by adding cold water in summer and warm in winter at the rate of sixteen to thirty quarts in each churning.

The temperature of the cream in summer when the churns are started is about sixty degrees, and in cold weather about sixty-eight degrees. It requires, and it is preferred, that from forty-five to sixty minutes be employed in churning, when the butter should come solid and of a rich yellow color. It is then taken from the churn and thoroughly washed in cold spring water, and salted the rate of eighteen ounces of salt and twenty-two pounds of butter, and for winter-kept butter a little more salt. After having been salted and worked over it is allowed to stand till evening, when it is worked a second time and packed. Great care is taken with the packages; they are of oak, strongly hooped, and perfectly tight, so as not to allow the least leakage. After being filled with butter, they are headed and strong brine poured in at the top to fill all the intervening spaces.

Dr. Jennings, of Dunkirk, N. Y., has recently invented a pan for farm dairies, which embodies to a considerable degree, the Orange Co., system of cooling the milk, and regulating temperature while the cream is rising. It is a shallow pan three to four inches deep, setting within a pan with space between the two on the sides and bottom for the reception of water.

They are made in sizes large enough to hold the milking of an entire dairy. The milk as it comes from the cow, is strained into the upper pan, until it fills it to the depth of 2 or 2½ inches. Then the space between the pans is filled with spring or well water, and the temperature of the milk reduced to 58 degrees. If the weather is cold, and there is probability that the temperature of the milk will fall much below this point, it can be obviated by drawing off some of the cold water and using warm water. I have tested this pan and can say that for private dairies it works admirably, making a superior quality of butter. Expense is a mere trifle, and could it be at once introduced, and this principle of temperature understood, the butter product of the country would be vastly improved.

The essentials, then, for a prime quality of butter, may be very briefly summed up, and are as follows: Securing rich, clean, healthy milk—milk obtained, if possible, on rich old pastures, free from weeds. Setting the milk in an untainted, well ventilated atmosphere and keeping it at an even temperature while the cream is rising; proper management in churning: washing out or otherwise thoroughly expelling the buttermilk; and working so as not to injure the grain of the butter; thorough and even incorporation of prime salt and packing in oaken tubs, tight, clean and well made.

CONCLUSION.

Farmers of Wisconsin! You who have cows upon your farms, whether it be five or a hundred, let me impress upon you, as I have done in my addresses to farmers in New York, in Ohio, in Illinois and in Canada, let me earnestly impress upon you that fine cheese and fine butter come only from clean healthy milk. I do not care how great may be the the knowledge of your manufacturers, nor what superhuman efforts they make to suit the markets, they cannot cleanse filthy milk, and out of it put upon the shelves and in the tubs, clean flavored and high priced butter and cheese.

The great demand now, both at home and abroad, is for sweet, nutty, new milk flavored goods. It depends upon you, farmers, whether your dairies and factories shall become noted as the best in the land, and their goods be sought after and contended for by shippers and consumers. There must be cleanliness in milking, there must be no dogging or racing of the herds to the stabl overheating the milk, inducing ferments and decomposition, no kicking and banging of cows, no commingling of diseased milk with the good. If you have cows that are sick or have diseased udders, throw their milk to the pigs. Do not poison your own and your neighbors' products by turning it into butter and cheese.

I do not come here to allure Wisconsin farmers, or intimate that they practice any of these things, because I know nothing of your history, but I know that such things have been common in New York and other states, where I have been, and I have raised my voice against it, that we may be able to bring the character of American dairy products where they shall have no rival in the markets of the world. It would be base in me to stand here and tell you that fine goods could be manufactured from bad, unclean milk, and you must not blame me for pointing out to you the true road to success. It may not be known to you, that fear or any nervous agitation of the cow, influences the quality of her milk. Fear acts powerfully upon the nervous system, destroying muscular fibre, deranging the secretions, and poisoning the blood. I have known colic and bowel complaint induced by taking the milk of a badly frightened cow.

Prof. Horsford has given an account of the changes produced in muscular fibre, by nervous agitation in animals slaughtered for beef. He has shown that in the frightened animal there was not only a disintegration of the fibre, but also a chemical decomposition of the substance of which the fibre is composed, causing it to lose its nutritiousness, and accordingly impairing its value as an article of food. He cites many instances, showing how the strength and healthfulness of muscle are diminished by pain, fear or fright, experienced by animals immediately previous to death, in a softening of the muscular tissues and in producing something such a change in their composition, as well as in the composition of the juices that are in conjunction with them, as is affected by fermentation. The chemical substances may all remain, but they have arranged themselves in new forms of combination which are less fitted for the purpose of ministering to the wants of man.

"At the burial of the dead, at Fair Oaks, it was observed that the bodies of the soldiers who were exposed to the most dangerous part of the field, and were consequently the subjects of extreme mental disquietude, were lacking in strength of muscle to such an extent that their arms drew out of their sockets, whenever it was attempted to remove the corpses by taking hold of the hand."

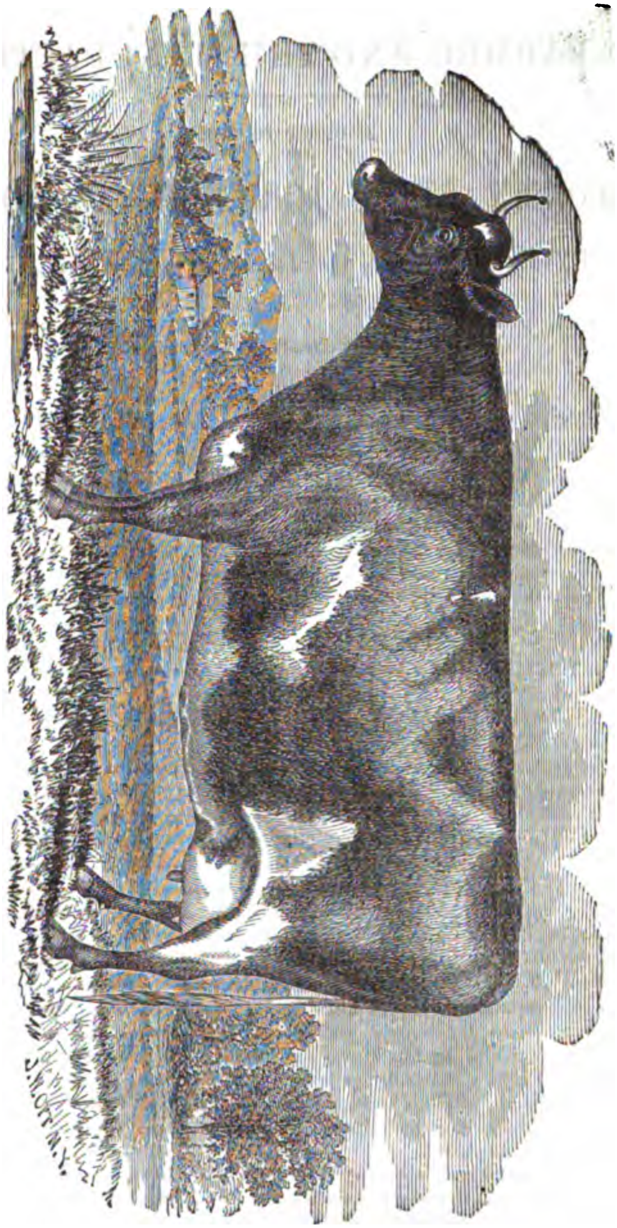
It appears that intense nervous agitation suffered by animals, results in a softening of the muscular tissues, and in producing something such a change in their composition, as well as in the composition of the juices that are in conjunction with them, as is effected by fermentation. The chemical substances may all remain, but they have arranged themselves in new forms of combination which are less fitted for the purpose of ministering to the wants of man.

I suspect many of the troubles in manufacturing milk , which cannot be accounted for, are the direct result of harsh and brutal treatment of cows by cruel men employed in their care. I wish you would think of these things, and be convinced that there is nothing pays better than kindness to milk stock. No man has a right to abuse his stock and keep them in a constant tremor of fear and nervous excitement, and then *poison consumers* with the milk and beef of such animals. Remember that the best milk comes from upland or well drained pasturage, and in the division of your lands, let the low or wetter portions, so far as possible, be devoted to meadows. Do not fall into the error of laying down pastures with one kind of grass; stock require variety in herbage, seed with a variety of seeds; timothy, the clovers, blue grass, red-top, fine meadow grass, (*poa serotina*,) meadow fescue, (*festuca pratensis*,) wire grass, (*poa compressa*,) sweet scented vernal and orchard grass, and with those native to your soil and climate. These will make the best pastures for your milk and beef.

Remember that many varieties of grasses growing together will produce more food, and make a more enduring turf.

Provide corn fodder at the rate of an acre for every eight cows, so that when pastures begin to fail in July and August you will always have an abundant store of succulent food at your command to keep up the flow of good milk. In this way you will turn your cattle to account and get from your lands remunerative results.

I thank you for your attention, and ask pardon for detaining you so long.



AYRSHIRE COW "HELEN DOUGLASS."—The property of Messrs. Walcott & Campbell, New York Mills, N. Y.

THE FARMER AND THE MANUFACTURER.

ADDRESS TO THE

WISCONSIN STATE AGRICULTURAL SOCIETY,

BY E. B. WARD, OF DETROIT, MICHIGAN.

MADISON, WISCONSIN, OCT. 1, 1868.

Gentlemen of the State Agricultural Society, and Men and Women of Wisconsin:

The State Fair is the result of the hard labor of the pioneers, who leveled the forests, and grubbed the stumps, and broke up the prairies, and washed and baked, working hard, early and late, out of doors and in, living simply, amidst rude surrounding. These products of the farm and the mill, so abundant and wonderful, could not be here unless they had struck the first blows, and gone through these heavy toils. Let us give them due honor.

Amidst better conditions you are following in their steps, and, indeed, many of you have been of their number and shared their privations, and are already seeing this young and vigorous State pass by the pioneer stage.

We are a working people, and when we see that labor has done so much in making the wilderness blossom and the waste places glad with civilized life, we should appreciate the privilege and duty of useful work.

Each and all should do something for their own and for the common good. We have small room for drones, or dignified genteel idlers.

For my own part, I want to be busy in some decent and useful way, and when the time comes I can work no longer with hand or brain, I pray that my life on earth may cease.

As this is a festival of workers, it is fit to see how labor can be best employed, and skill wisely guided, to effect highest results. The pioneer's first effort was to struggle for bread, his first occupation tilling the soil, which gave rich returns. Next he sold a little surplus to any market, far or near, and that surplus has now grown great, and its transportation to markets far away costs a large part of its price. England takes little of your wheat, but she governs the price, and it takes two men to carry to Liverpool the corn one man can raise in Wisconsin. Cheaper modes of transit can and should be had, in time, which will remedy this in some small degree, but the more thorough remedy I will speak of soon. As the surplus grows large capital accumulates, and means are at hand to undertake new enterprises, but the people make the mistake of supposing that farming and the exporting of produce, inevitably the great work of the pioneer, can be still pursued almost exclusively, with lasting profit and benefit. This is a grave mistake indeed, and it is folly and blindness for us to listen to the flattery of our British cousins over the ocean, about our being "the granary of the world." Of course, with this breadth of rich soil, farming will always be important, but we must have home manufactures, and a great home market, if we would make farming pay, and have a surplus also to send abroad.

Agriculture alone never made a country rich or civilized. Ireland has a rich soil but England has cruelly crushed her manufactures, and she is poor. Portugal and Spain, deluded by England into "free trade," and, of course with limited manufactures, are poor. France, with the same Celtic race, a more protective policy, and larger manufactures, has more wealth and far better farms. So it is the world over.

It is folly for one class to try to stand alone, or to look upon others with jealousy. We depend on each other. Farms or factories only thrive best when they are near each other, so that they can help each other easier. They are natural allies. Diversified industry is the "manifest destiny" of the northwest, and thus the farmers will partake of the common prosperity. England has no room for farming, as we have, and while her manufacturing puts great wealth in a few hands, her landless people are poor. Here there is room for homes and farms for an independent people. Here are metals, fuel, food, and raw materials for textile fabrics in abundance. Here are skill and energy, capital increasing, and labor accessible. No country in the world has such natural capacity for great and varied manufacturing and farming as the northwest.

There are now at work in Europe at least 1,250,000 people, whose products are brought to this country for sale. These people you support by sending them your grain, at an enormous expense for freight, and buying their handiwork. If the 4,000 factories now employed in Europe on American fabrics and commodities were trasported to the Western States, with one-half the operatives to work them (you could easily furnish the other half), it would have the immediate effect to increase the value of your farms four or five fold.

Suppose on the other hand that all the people of the northwest, with all the new emigrants, continue to confine themselves to the productions of agricultural staples, and that everybody who works at all is driven into that employment, what will be the certain result? Over production, low prices, poor, idle, and as an inevitable result in the end, uneducated and vicious people.

Your land is rich to-day but will be poor to morrow if this exporting process goes on. Its exhaustion is only a question of time. The best farming is where the best manufacturing stimulates skill. The soil of England is thinner than yours, but her average wheat crop is twenty-eight bushels per acre, and that average gains, while in this country we have reduced our yield more than half, to an average of only twelve bushels an acre.

In England you find roots and other crops in rotation, covering half the arable soil, and the small wheat fields kept rich by this skillful management, yield heavily. With us no such variety of crops, and less wheat on two acres than on one over the ocean. In New England we find excellent farming, and poor land growing richer, because the market is near and excellent.

J. H. Klippart, Secretary of the Ohio State Board of Agriculture, said in 1860: "Several years ago I became aware of the fact that wheat—the staple of Ohio—was annually diminishing its yield; that in less than fifty years the average product was reduced from thirty to less than fifteen bushels per acre. I also learned that in Great Britain the yield, at the same time, had increased from sixteen to thirty-six bushels per acre. Portions of New York that formerly produced thirty bushels, now seldom average over eight; and Ohio, with her virgin soil, is reduced to thirteen. Unless our farmers soon turn their attention to renovation, even Ohio will *soon be among the non-producing wheat lands.*"

Wisconsin will follow the same dismal path, unless there be a change, and only the building up of manufactures can avert this calamity.

Mr. Klippart says of the former wheat lands of New York, Maryland, Virginia and Delaware: "Exhaustion is written all over them in language too plain to be misunderstood."

Facts might be given in regard to the yield of cotton, corn and tobacco, all with the same pitiful result. The reason is simple enough.

Constant exportation of wheat, or any product, exhausts the soil of the constituents necessary for the growth of that product, with no device by which they are returned to the soil. In a paper read before the Geographical Society of New York, by Mr. Waring, he says:

"In my opinion it would be improper to estimate the total annual wastes of the country at less than equal to the mineral constituents of *fifteen hundred million bushels of corn.* To suppose this can continue, and we can remain prosperous, is simply ridiculous. As yet we have much virgin soil, and it will be long ere we reap the full fruits of our improvidence, but it is merely a question of time. With our earth-butchery and prodigality we are each year losing the intrinsic essence of our vitality."

These are grave truths, and "forewarned, forearmed" is a good motto for us, before our yet new soil is exhausted. You may truly say that better farming would lessen this waste, but you look in vain for this better farming, save where the factory and the farm are neighbors. Diversified industry is the remedy. Much attention has been paid to cheaper transportation to the seaboard, and I have read with interest the proceeding of farmers' meeting for that object in Illinois and this State. All proper and important, and worthy of just success, but I have greatly wished that the increasing of the home market had claimed equally intelligent thought and discussion, for the one but alleviates a chronic complaint, the other cures the disorder.

Wisconsin has a special interest in this matter. You raise wheat largely, but the great corn crops and cattle herds of Illinois you hardly rival. The exportation of a single leading staple is exhausting and hazardous, and should lead to the development of other resources.

Your wool crop is large, it is true, but what folly to send away a pound of it. The lumber from your pine forests will be exhausted, the large export of wheat, with small home consumption, will impoverish your soil, your farming will not improve if you keep up the old habits; but turn to the exhaustless stores of iron and coal and peat, so easily accessible in and near your borders, bind the swift streams to your service to turn your water-wheels, build factories and shops and iron mills, weave your own cloths, shape your own tools, make your own iron and steel, feed the workmen from your farms, and thus diversify their products, and the day of your redemption is at hand. In the great exposition of wool and woolens at Chicago in August, I shared the pleasure and surprise of all there, at the quantity and quality of the products of Western skill exhibited. I saw woolens from your State, not only serviceable but beautiful—good enough for any man to wear anywhere. You have already some eighty woolen mills, making excellent and honest cloths, with no shoddy in them. But you sell wool to go eastward, pay freights, commissions and profits, both ways, and get back imported woolens, nicely finished, but shoddy-mixed—and shoddy and shabby are the same after a little wear. You have iron ores of the finest quality, and send to England to buy rails, so poor that no other market in the world will take them, and lay them down over the very mines where lies your own iron waiting to be wrought by the hands of decently paid and hopeful American workmen.

Capital likes good investments and quick returns, yet it can live, and wait, and take advantage of poverty. Labor wants constant and decently paid occupation. Diversified industry is desirable to the capitalist, but far more so, and more necessary to the workman. If I had a million dollars it would need no great wit to go into a region where cash was scarce, because the people were far from market, loan money to farmers, and swallow up their farms, according to law, if not according to gospel, by relentless foreclosure of mortgages. But suppose I invested the million in woolen, or cotton, or iron mills, bought the product of those farms for the workmen, and employed the surplus laborers, there need be no mortgages, but the lands would rise five or ten fold in value.

I should not be acting as a philanthropist, but simply as a business man, helping others to prosper that I might share in that prosperity. A factory with a capital of $500,000 will spend about that sum yearly for materials and labor, and the larger part circulates among the people.

Let the blood stagnate or move too slow in the veins and a man is sick—the strong and ready pulsation is health. So with business; it is rapid and easy circulation of money, quick returns, nearness of producer and consumer, demand for labor of all kinds, and sale and interchange of its products, that makes health and brings wealth.

An able French journal well says:

"That which, above all, agriculture claims, is the multiplication of markets, its greatest need being that of a non-agricultural population. What is it that presents itself to view in our poorest provinces? A people thinly scattered and almost entirely rural; not working within reach of a market; consuming on the spot their own local productions; with few or no towns, no industry, and no commerce beyond that which is strictly necessary for supplying the limited wants of their inhabitants. There, the poor proprietor divides the produce with miserable tenants, the inevitable result of agriculture without a market. Our manufacturing departments, on the other hand, are by far the best cultivated, and for that reason the most productive. There, our agriculture has proved her ability to realize by other means, but in an equal degree, the wonders of English husbandry. *Wherever a large centre of consumption is formed, the neighboring farmers are the first to profit by it This law is infallible, and allows of no exception.*"

At the fair of the New England Agricultural Society, in Brattleboro, Vt., in 1866, Hon. John A. Andrew eloquently said:

"I desire to attract the observation of this body of intelligent agriculturists to the subject of the diversification of industry, in its relation to the prosperity of the American farmer. I can do little more than remind you that while population has grown beyond a precedent, wealth has advanced beyond population; that in proportion as our industry has become diversified, our capacity to purchase and enjoy the fruits of the earth has been much more than correspondingly enlarged; and that the union of the people in a common purpose to develop all their powers, by whatever means, whether intellectual or mechanical, is the secret of their own growth, and the amelioration of the estate of man.

"Better fed, with more fullness and variety; better clad, in more garments, and those more pleasing to the sense of beauty; better sheltered, by houses more commodious, and in styles of more tasteful architecture, and more enduring quality; with more books and newspapers, and larger public libraries; enjoying incomparably more avenues and better means for traveling, and for transportation of goods; with ampler crops and better prices than ever before—this very commonwealth does, in its own current history, afford the proof of the advantages of our American aim at the largest conquest over all the domains of industry."

Words well worthy the heart and the head of a noble and lamented son of New England, who once illustrated the genuineness of his Democracy, by saying to a large audience, "Whatever other sins may be laid to my charge, and doubtless there are many, I thank God I was never mean enough to despise a man because he was poor, or ignorant, or black." Let it be our effort to hasten the day when what he says of these aspects of New England life, which are the results of her diversified industry, may be as true of Wisconsin as of the "Old Bay State."

With a variety of occupations, all find something to do; with few kinds of labor much power is wasted in idleness. In Wisconsin there are some 40,000 women and children of suitable age for light labor, willing and able to work. In New England they would all find employment. Suppose they could earn, with you, 50 cents each a day in manufacturing establishments; that would be $3 a week, each, or $120,000 for all, and $6,240,000 a year, or $62,400,000 in ten years, in addition to the present wealth of your State. Savings banks are mostly places of deposit for the surplus earnings of working people. In 1866, notwithstanding the fact that large sums were invested by the same class in government bonds, there was deposited in the savings banks of Massachusetts $67,000,000.

Statistics of the wealth and yearly income of England, carefully prepared by Mr. McQueen, sum up this conclusion: "Capital usefully employed in manufactures by an agricultural nation in time increases the value of the soil ten fold."

The special advantage of the Northwest is that we have ample room for farming as well as manufacturing, and thus the conditions which not only create wealth but distribute it among the intelligent land owners and artizans.

It would be of great interest to enlarge on what must be passed by with a simple statement—varied industry helps to civilization and wealth of soul and life, as well as of purse. While it enlarges the capacity to enjoy the fruits of labor, and multiplies and distributes their enjoyment, it stimulates art, science, and all higher moral and mental powers.

Some of your new towns which have sprung up and driven so rapidly have reached their growth, and others will soon do so. Nobody with us enjoys living in a town "all finished, painted and fenced in," as the saying is. Let such towns build up manufactures, and thus help themselves to a new life, and add to the value and enjoyment of the country around.

Not the least benefit of diversified industry is to build up many thriving towns, instead of the few great centres of trade, which absorb all around them in an agricultural community, taking much and giving back little.

The West has made rapid advances in manufacturing, for we find by the census returns of 1860 that the value of manufactures of all kinds for that year in the eleven Western States was $390,411,942, giving employ to 222,325 persons, but the twelve New England and Middle States turned out $1,298,207,058 worth, and employed 1,025,000 persons. Your own State, being new, hardly did its proportion in this work with Ohio and Indiana, but we find that the woolen mills of Wisconsin had increased from fifteen, with a yearly product of $115,000, in 1860, to sixty or eighty, yielding $562,500 worth of cloths, in 1866, while the 560 mills of the seven States of Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa and Minnesota turned out about $4,200,000 worth. A good beginning, but we must keep on and overtake Massachusetts with her great mills turning out $40,000,000 worth yearly, and the wool-growers of Wisconsin, learning the kinds of wool, long or short, for combing or carding, that your manufacturers want, should take care that their home market is fully supplied even if it takes millions of sheep to do it.

Let me put it fairly to you, farmers of Wisconsin. Do you want to banish these woolen manufacturers? Would you think it a benefit to be compelled to sell all your wool in the distance and buy a half million dollars worth of shoddy-cloths from over the ocean in place of the honest goods they make for you? Would you not be glad to have scores of woolen mills to each one now running?

Iron ore is valueless in the ground, and labor gives it value. It costs about eighty dollars, paid to workmen, to make a ton of iron.

Which is best for you, to send your wheat to Liverpool and take it back in poor English iron, with heavy freight and commissions deducted, and your rich land made poor by the export of its crops, or to feed the iron makers at your doors, save expenses, get better iron, quick returns, better prices, and keep your land in good heart?

The West produced, in 1867, 500,000 tons of pig iron and 200,000 tons of bars, and plates, and rails, and our total product of iron and steel was worth over $45,000,000.

Would you send that sum to England to swell her yearly iron and steel exports of $75,000,000, and increase your debt? or would you increase this business, which is labor creating value from coarse raw material, and reach to the point of exporting the product of your mines, the richest in the world? Iron ships, built on the Clyde, navigate the ocean. You may remember iron blockade runners—armed to scourge our commerce also—come from the same locality, and built to order for certain Britons of the baser sort. (Thank Heaven, the Brights, and Thompsons, and the cotton spinners in English mills, poor in purse but rich in soul and in loyalty to free labor the world over, had no fellowship in such greedy meanness). Iron ships built at our own yards, by our own workmen, from our own iron, should navigate our lakes, and rivers, and the ocean.

Shall the hum of the spindle, the roar of the waterfall, the puff of the engine, and the clang of the triphammer cease in your borders, that England may find market for her wares, while you keep on being "the world's granary" until your land is too poor to raise wheat?

You will answer these questions for yourselves and your children. Fail to diversify your industry and your path leads down to decay of purse, and soil, and soul; give your labor and skill many ways to act, and that path leads up to wealth of soil and of soul.

Agriculture and manufactures are the creators of useful materials and finished products. Commerce only transports and exchanges what they bring into being. Neither can thrive without the other, and neither can gain by overreaching the other.

Lessen our manufactures, and, for a time, a few importing traders might gain, but the power of the country to buy from abroad would soon decrease, and the home trade would languish. Let our manufactures thrive, and our agriculture with them, and our power to buy abroad such articles as can best be produced in other lands increases, our importations are healthy, and our internal trade—far greater and more important than the foreign—keeps active and strong.

Protection to home industry is the business of a good government, and its advocacy the duty of the intelligent and enlightened citizen. Not monopoly for the benefit of any one class, but protection to that degree needed to encourage manufactures and benefit farmers, and keep our balance of trade healthy. You do not need tariff on wheat to prevent its import from Europe, for the freight is a tariff, but a roll of English or German cloth is a car-load of cheap foreign corn, packed in small compass, and if you buy it you help to keep down the price of your grain to its level. Better make it here, and have your home market govern a price that shall rule higher than in Liverpool or Hamburg.

How can a farmer raise wool and pay his laborer decent wages for a civilized man, and compete with half-naked herdsmen in Australia or South America? Is it easy even for a cotton-grower, paying his laborer $20 a month, to compete with Egypt and India at $5, or even $3 a month wages? In 1864, by the accurate report of the revenue commission, it appears the wages of an English iron puddler were $1 80 per ton, or 90 cents per day, those of an American $6 54 per ton, or $3 27 per day—much more here than there, allowing for higher cost of living. Can we so shape affairs that American workers, in the field and mill, shall be decently paid for doing our own work? Or must we come to the pauper wages of the old world?

The elevation of labor is called "the sentiment which created civilization." Sometimes we find a frank statement of the effect of "free trade," as in a late New York journal.

"I am for unqualified free trade. I would sell out the custom houses, discharge the leeches there, and allow people to sell and buy wherever they chose. This will bring us to a true and normal relation.

"Commercial disturbance would result. We should be on a new foundation. The first effect would be to stop manufacturing here and fill the country with foreign goods, many of which Europe would never see her money for. A commercial revolution would follow, laborers would be out of employment, *and the price of labor would come down, down, until it reached the European standard, and then success is secured.*

Success, possibly, for the few, but hard work at pauper pay for the many!

If a farmer half tills his land, and buys silks, gewgaws, cloth, etc., more than he pays for, year by year, no matter how large or rich his farm, he comes to trouble at last. So with a nation. Our trouble is the great and growing tendency to idleness and extravagance. Our boys complain of work, and want to be clerks or government officials. Our girls waste their time on frivolity and dress, and mechanics and laborers want large pay for little work, and we see as the result high prices for all the products of industry, large importations of foreign commodities to supply the deficencies caused by our idleness, a steadily increasing foreign debt, and gold at a high and increasing premium.

A great number of healthy men are seeking or are holding public offices as a means of easy support, while the number and cost of such offices ought to be largely reduced. Young men, if you would have your manhood dwindle and fade away, and be a genteel and subservient pauper, be a seeker for government office. If you would be manly and independent, keep to your farms or trades.

People talk about specie payments, and bonds, and debt. Overtrading with Europe, and underwork at home, and want of development of our great resources, cause these financial troubles. Remove these causes, and we can resume specie payments in two years without distress or revulsion.

At the close of a great war, when we ought to have been prudent, if ever, our reckless importations reached $437,000,000, or, deducting $9,000,000 specie imported, $428,000,000. But the Secretary of the Treasury says that the undervaluations at the Custom Houses are some 20 per cent., which is a low estimate, and we must add that amount, or $85,720,000, and make a total of $514,320,000, for a single year's imports in 1867. Of this vast sum there was

Cotton manufactories	$ 30,844,391
Iron and steel	24,000,000
Wool and its manufactures	66,800,000
	$121,644,391

All this the Northwest alone should have produced or manufactured, but we have gone on and allowed our imports to far exceed our exports or ability to pay, until our debt in Europe, mostly in England and Germany, is some $1,500,000,000, including National, State, railroad, and municipal bonds, and stocks; and our National obligations in the shape of bonds are tossed about by foreign bankers at a shameful and ruinous discount. The yearly interest of this great debt is $90,000,000, in gold, or more than all our mines produce.

From January 1st to August 1st, seven months, the exports of specie to Europe were $60,000,000, while our receipts from California were but $25,000,000, and at last the *"New York Shipping and Commercial List,"* uttering the views of great bankers and importers, says on the 8th of August: "Various theories have been adduced (in regard to the rise of gold), but it would not be difficult to show that the real cause is mainly the result of an uneven foreign trade movement, that is, the undue preponderance of imports over exports, thus leaving a large balance against the country, which is necessarily draining us of a vast amount of treasure, since bonds are no longer available, in adequate quantities, for that purpose." I am glad to see in such a journal such clear statement of our danger and its main cause. Repeatedly, for years back, I have made the same statement, which was passed by almost unheeded, but is at last seen in all its dangerous magnitude. More work and less extravagance, more production and less importation, more development of our natural resources, more diversified industry to make our labor pay better, and the debt decreases, specie payment results, and the vexed question of greenbacks and bonds get settled.

For this increased production we must have more manufactures, for mingled agriculture and manufacturers, such as you can have here, are the great sources of wealth and prosperity.

That well known philanthropist, Peter Cooper, of New York, has carefully prepared a table, from the Treasury Reports of 1856 and '57, showing the production, for each man, woman and child, white or black, in the States, which shows the great advantage of the manufacturing States. I give a part of it to illustrate:

Massachusetts	$166 60
Wisconsin	68 41
Rhode Island	164 61
Indiana	99 12
Connecticut	156 05
California (gold included)	149 96

Move on in Wisconsin and you can overtop Massachusetts, but you must move in that path. Being "the world's granary" and importing your goods from Europe never will carry you there. You see the "wooden nutmegs" of Connecticut are worth more than the gold nuggets of California, and may learn that the iron mines and fleeces in your midst can be made of more value than richest gold beds.

I have nothing to say about motives or intentions, but, in fact, the man who advocates and supports what is called "free trade" is an enemy to our country's good, and especially to the good of the Northwest. The free trade cry comes from England, a country that now levies duties on imports to the amount of about $100,000,000 yearly, and puts a tariff of 300 per cent. on the tobacco we send them. In 1859 the duty on American tobacco imposed by the British government was $18,724,420.

A witty Frenchman, Baron Dupin, well said in 1852: "When the British Parliament applaud the enfranchisement of the world's commerce, they clap their hands, and those hands are covered by English gloves, protected against foreign gloves by a duty of 25 per cent."

England has always taken care of her manufactures until they could stand strong, no matter how long it took. In the fourteenth century Edward III. forbade the exportation of rams, and levied heavy taxes on imported woolens, calling a Parliament almost wholly to legislate on the matter. In 1772 there were 311 laws on wool and woolens, aiming at the building up of this great industry. In the days of Queen Elizabeth, Lord Bacon said to her Ministers, "Let us turn the wools of our land into cloths of our own growth. It would set many thousands at work, and multiply the materials five, ten or twenty times in value." Thus, for over four hundred years, England constantly took care of her woolen interest.

In 1610 the protective duty on foreign bar iron was $12.50 per ton; in 1782, $14; in 1803, $21; in 1806, $27; in 1819, $32,50; in 1836 it was reduced to $7.50. Why? *Because through an unwavering policy of protection for a century and a half her iron had obtained the mastery over all competition.* Then it was time to cry "Hurrah for free trade in woolens and iron the world over!"

As has been well said by Hon. D. J. Morrell, of Pennsylvania: "During the last century an institution was founded in England, under the style of 'The Society for Propagating the Gospel in Foreign Parts,' whose munificent and practical benevolence is attested by many churches still standing in this country, erected by funds which it supplied. The great missionary enterprise to which England of to-day is devoted is the propagation in 'foreign parts' of the doctrines of a political religion—the gospel of free trade. Its tracts are the essays of British economists, its culporteurs, her commercial traders, its foreign missionaries, the representatives of the press of our leading commercial city, and its churches, our bonded warehouses. No influence which can contribute to the spread of this religion is despised; no accessible organ which can affect opinion abroad remains unsubsidized."

The solicitude of the English for our adoption of their "free trade" *professions* as our *practice* can hardly arise from philanthropy, as they are not vastly better or worse than other people.

In 1846, when our tariff was reduced, firms in Manchester and Glasgow paid some $60,000 to that end, and over $1,000,000 of British money was spent in Washington. Samples of foreign goods were shown in a basement room of the Capitol, used for that purpose, and to-day there is no lack of money from interested foreign parties to propagate the same "political gospel."

But even John Stuart Mill, an able advocate of free trade, says in his Political Economy: "The superiority of one country over another in a branch of production often arises only from having begun it sooner. There may be no inherent advantage on one part, or disadvantage on the other, but only a present superiority of skill and experience. A country which has this skill and experience yet to acquire may in other respects be better adapted to the production than those which were earlier in the field; and, beside, it is a just remark, that nothing has a greater tendency to produce improvement in any branch of production than its trial under a new set of conditions. *But it cannot be expected that individuals should at their own cost,* introduce a new manufacture, and bear the burdens of carrying it on until the producers have *been educated* up to the line of those with whom the processes have become traditional. A protective duty, continued for a reasonable time, will sometimes be the least inconvenient mode in which a country can tax itself for the support of such an experiment."

This covers the whole ground of *protection as a principle,* and his only error is in considering as a tax that which is a help and benefit.

In 1825 heavy cottons were sold in New England for 23¾ cents per yard, in 1840 for 12 cents, in 1855 for 9½ cents. Cotton hosiery went down from 25 cents in 1860, to 12½ cents a pair to-day. Lawns were imported from England in 1846 at 28 to 30 cents, then we undersold them. Delaines, of which we consume two yards to each of our population, were imported at 28 to 30 cents; a better home-made article now sells at 20 cents. Carpets have been reduced 25 per cent. by economies and processes introduced here. Our shoe industry excels the world in quality and beauty, and only needs a tariff to guard against fluctuations abroad. Ten years ago our cast steel was imported from England at a duty of but 12 per cent., and its average price was 18 cents per pound. In 1860 its manufacture commenced in Pittsburgh, and in 1861 the duty was doubled, but the foreign article went down to 13 cents, and ours a trifle lower. Gold premium and war prices carried English steel up to 45 cents, but ours was sold, of equal quality, at 32 cents, and our Government and people thus saved millions in the war, and were saved from pitiful dependence on a foreign power not especially friendly to us in the days of our peril.

These reduced prices, all under protection, are no great tax, surely.

John Quincy Adams, in a Report from the Committee on Manufacturers to Congress, in 1832, said: "The first act of the first Congress was an act levying duties on importations, and this act, by an exception to the general rule, was preceded by a preamble as follows:

'WHEREAS, it is necessary, for the support of the Government, for the discharge of the debt of the United States, and the encouragment and *protection* of manufactures, that duties be levied on goods, wares and merchandise imported.'"

And that able patriot argued that this was a part of their duty "to provide for the common defence," saying, "This common defence must be provided for as much against commercial rivalry as warlike invasion, for the spirit of traffic armed with power, as the experience of mankind has proved is more insatiate and grasping that all the Alexanders and Cæsars that ambition has inflicted on men."

The sagacious Franklin, writing from London in 1771 to Humphrey Marshall, said:

"Every manufacture encouraged in our country makes part of a *market* for provisions within ourselves, and saves so much money to the country as must otherwise be exported to pay for the manufactures he supplies. Here in England it is well known and understood that wherever a manufacture is established which employs a number of hands it raises the value of land in the neighboring country all around it. It seems, therefore, the interest of our farmers and owners of land to encourage our young manufacturers in preference to foreign ones."

Thomas Jefferson said to Benjamin Austin, in 1816:

"You tell me I am quoted by those who wish to continue our dependence on England for manufactures. There was a time when I might have been so quoted with more candor. * * We have since experienced what we did not then believe—that there exists both profligacy and power enough to exclude us from the field of interchange with other nations; that to be independent for the comforts of life we must fabricate them ourselves. We must now place the manufacturer by the side of the agriculturist."

Andrew Jackson, in 1826, wrote to Dr. Coleman:

"In short, sir, we have been too long subject to the policy of British merchants. It is time that we should become a little more *Americanized*, and instead of feeding the paupers and laborers of England, feed our own, or else in a short time, by continuing our present policy, we shall be rendered paupers ourselves."

Henry Clay, speaking of the balance of trade against this country, uttered words worthy of heed to-day:

"In the mean time there will be an export of the precious metals, to the deep injury of internal trade, an export of public securities, a resort to credit, debt, mortgages. All of these conditions are believed now to be indicated by our country in its commercial relation. What have we received for the bonds sent to England? Goods. But these bonds must be paid."

In 1846, Daniel Webster, looking into the future of this Northwest, sagaciously said:

"The Northwestern States are designed to be manufacturing States. They have iron and coal They have a people of laborious habits. They have already capital enough to begin works such as belong to new States and new communities; and when the time comes—and it cannot but come soon—they will see their true interest to be to feed the Northern and Eastern manufacturers, as far as they may require it, and in the mean time begin to vary their own occupations, by having classes of men among them who are not of the now universal agricultural population. The sooner they begin this work the better; and begin it they will, because they are an intelligent and active people, and cannot fail to see in what direction their true interest lies."

These are the opinions of great Americans. Similar opinions of great Europeans might be given.

Our distinguished Political Economist, Henry C. Carey, well known in both Continents, and whose masterly writings should be in every home-library and in every school, well says:

"Steadiness and regularity in the returns to agricultural labor grow with increase in the variety of commodities produced in the land. Disease tends to disappear as population increases and a near market is created. The poor Irishman sees his potatoes perish of rot, consequent on the increasing exhaustion of soil; the Portuguese witnesses his hopes destroyed by the vine disease; the American farmer is visited by blight, resulting from taking from the soil the material for the ever-recurring wheat crop. The man who has a market at his door finds blight and insects vanish, and is able to make his crops more certain."

This plot of keeping back diversified industry in the Northwest is of Southern origin, and you have been kept raising cheap food by the craft of the same class of men who rebelled against our free institutions, and slaughtered your sons in the struggle.

A book was published at Augusta, Ga., sold only by subscription, and thus kept away from the North, while it was a sort of political gospel on the tables of leading slaveholders. A copy was brought away from some rebel's library by one of the "boys in blue," from which I make extracts.

The title of this large volume is "Cotton is King, and Pro-Slavery Arguments, comprising the writings of Hammond, Harper, Christie, Stringfellow, Hodge, Bledsoe and Cartwright on this important subject; by E. N. Elliott, D. D., President of Planter's College, Mississippi; with an Essay on Slavery in the light of International Law, by the Editor."

It is the plots and plans of the slave power, got up for their own study and use, and a part of the base scheme was to form an alliance with British cotton spinners, raise the delusive cry of "free trade," to give them a market for their cotton goods, and to keep down manufacturing in the North and West, that you might raise cheap food for their negroes?

A writer on the "Economic Relations of Slavery" thus states the case:

"But they could not monopolize the market for cotton unless they could obtain a cheap supply of food and clothing for their negroes, and raise their cotton cheaper than their rivals. *A manufacturing population, with its mechanical coadjutors amidst the provision growers, on a scale such as the protective policy proposed, would create a permanent market (at home) for their products and enhance the price, whereas, if this manufacturing could be prevented, and a system of free trade be adopted, the South could be the chief provision market, and the fertile land North supply the cheap food for our slaves.* * * * *

"If they could establish free trade it would *insure the American market to foreign manufacturers*, secure the foreign market for their cotton, repress home manufactures, force a large number of northern men into agriculture, multiply the growth and *diminish the price of provisions*, and feed and clothe their slaves at lower rates."

The writer goes on to show how the West "had its attention turned South for a market," and fully reveals their scheme for making you pioneers of the West work cheap, and keep factories away, for their benefit, under a "free trade" delusion, to strengthen which "the southern planter and the English manufacturer became united." Comment is needless. Farmers of Wisconsin, how do you like the plot?

I present these facts because no class of men in this country should have more interest in, or would reap equal benefit from, the building up of varied industry in this region than the farmers, and it is important they should have clear views of the best means and wisest policy to that end.

We greatly overrate the importance of the English grain market.

When the British corn laws were repealed, the inducement was held out by the English, and the hope entertained by our grain growers, that a large market would open there for our products.

But, in twelve years *after the repeal of the corn laws*, from 1848 to 1860, our exports of breadstuffs to England had *decreased*, in proportion to our population, *almost thirty per cent.*, even by English estimate twenty-seven and a half per cent.

During the same years the British imports of grain from this country were *only one-fifth their imports from other countries.*

Milwaukee and Chicago often send off in ten days more grain and flour than England has taken from us each year, on the average, for twenty years past.

The eleven Northwestern States, in 1860, produced $900,000,000 worth of grain and provisions for consumption and export, of which only $25,000,000 worth went to foreign countries, and less than half of that to Great Britain, while our Eastern States and the South took $190,248,655 worth, or more than seven and a half times as much as all foreign countries. New England is a larger market for us than Old England. The annual average of our exports to Great Britain from 1846 to 1860 inclusive, is computed at only $6,048,645.

Your farming needs great improvement. With change of crops, root culture, deep ploughing, under-draining, plaster and manure, I doubt not your products per acre will vastly increase, and that fruits and other products you now find it hard to raise will yield abundantly. You need to plant orchards and to have groves of trees growing to shield exposed lands on the prairies from the blasts of the winter wind.

All the labor and money spent in this way will be repaid a hundred fold; and it would be timely wisdom if township and county Agricultural Societies would combine some broad plans for the planting of trees, and perhaps laws might be passed for that purpose. But all these improvements, so greatly needed, I have little expectation of seeing until you diversify your industry and increase your home market.

Let me warn you of another great change that is coming. The South will not only raise their own grain, but compete with you on the seaboard and in Europe. That region has so long been looked at as fit only to produce cotton, and rice, and sugar, that we forget its capacity for grain growing. From Virginia through to Alabama and Louisiana are great tracts of the finest wheat regions, capable of producing that grain of the choicest quality, and putting it in market in New York or Boston a month or more earlier than you can, and at no more cost. This is beginning already, and it is *sure to come*, and it is well for you to foresee and prepare for it.

Its approach should stimulate you anew in your good work of putting farm and factory side by side, and should lead you also to look about, and find, if possible, some new product, fitted for your soil and climate, that may help to keep all right.

Such a product is in your reach in the sugar beet, the culture of which, and the manufacture of sugar, should grow up in the Northwest, in ten years time, to an extent sufficient to stop importations, and keep at home $40,000,000 we send abroad yearly for sugar.

In France, this great industry, starting into new life under the efforts of the great Napoleon—who resolved to counteract the British blockade, which had raised the price of sugar to a dollar a pound, and offered premiums and imposed heavy tariffs on imported sugar—had no marked or rapid progress until 1818, but now compete with cane-sugar, and instead of wanting a tariff pays a large sum in government taxes.

From a report of the active and able Commissioner of Agriculture in Washington, Hon. Horace Capron, who is gaining much valuable information on this important subject, I learn that: "At the first of January, 1868, 3,173 refineries of beet root sugar were reported as in operation in Europe.

"*The total product in* 1828 *is stated to have been* 7,000 *tons; in* 1851, 180,000 *tons; and in* 1867 *the enormous quantity of* 663,000 *tons, or* 1,485,120,000 *pounds, worth* $100,000,000, *or about seven cents per pound.*

"Sixteen years ago, France was able to manufacture half of her total consumption of sugar, or 60,000 tons; and Belgium, consuming 14,000 tons, imported, in 1851, but 4,000 tons, Germany, at the same date, produced 48,000 tons; Austria, 15,000, and Russia 35,000 tons; the latter country also importing, at that time, 50,000 tons of sugar in addition to the home product. *The total manufacture of Europe, as stated above, has been almost quadrupled since that date, and cane sugar in several of those States is now scarcely known.*

* * * * * * * * * * * *

"The product of beets per acre is from fourteen to fifteen tons in France and Belgium. Enormous crops have occasionally been reported, 110 tons per acre in one instance.

"A ton of beets yields about one hundred pounds of raw sugar. At first the proportion of sugar obtained was but three per cent; it was increased to six, and even to seven and a half per cent.

"The beet cake for feeding purposes, the molasses, alcohol, and other products obtained, greatly increase the aggregate which makes the total value of this branch of industry. Beet sugar districts become so enriched that far greater amounts of the cereals and other products of agriculture are obtained than before beet factories were known.

"The growing of the beet requires rotation, as well as thorough culture and careful weeding. It would therefore be a boon of untold value to our wheat-producing districts of the West, which are decreasing year by year in returns for labor expended from these causes, and the additional neglect of stock growing.

"A promising beginning in beet sugar making has been commenced in Chatsworth, Illinois, and fine samples of its sugar may be seen in the museum of this department. A history of this enterprise will hereafter be given.

"Another feature of the business is worthy of attention. The production of the sugar beet by by farmers, for sale in a dried state to manufactures of sugar, may be made to yield an immense revenue to rural industry. The beets are cut in small pieces after washing, and dried by artificial heat, by which process from eighty to eighty-four per cent. of their weight is expelled, leaving a residue containing fifty-five per cent. or more of sugar, which is extracted by infusion, often after months of delay and transportation to distant factories. A specimen of this dried beet can be seen in this department, made by Thomas Gennert, of Chatsworth, Ill., who claims about 80 per cent. of sugar in it. As an illustration of the extent of such a business, a record may be cited of an establishment for obtaining sugar by infusion of dried beet, at Waghausel, near Carlsruhe, in the Grand Duchy of Baden, in which 3,000 people were employed, a capital of eighty millions of francs (or sixteen million dollars) used, and twelve acres of land covered with buildings."

In Germany, the beet sugar paid last year $12,678,000 in a tax to the government, and could defy competition; and in France 120,000 tons were made in three months, in 1867.

What they have done we can do surely. Let that crop be a means of improvement and wealth among you, and, if it be necessary, the National Government should take measures for the encouragement of this important industry.

It is a privilege to meet the working men and women of Wisconsin on an occasion like this.

I have offered these views and presented these facts not as new or original with me, but because I feel they are of vital importance with us, and to that Future we would make great and truly noble.

I have dwelt on the importance of building up diversified industry, because it is of great importance to farmers, and to all. In the fit words of another:

"We cannot have the best farming until we have the best manufacturing, in varied forms and materials, each an indispensable help to the growth and perfectness of the other.

"Give us both, and the blending of these varied experiences and vocations, the meeting and mingling of these many life-currents, tinged and shaped by such mastery of man over Nature's forces and materials, is full of benefit. It is civilization, culture, wealth of soul as well as of purse. To the farmer it is increase of the product of his acres, economy of exchange, work of hand or brain, for whatever gift of power or character his children may possess, instant and constant call for a variety of labor, and all the while the thrill of inventive genius pulsing through the serene quiet of his life in the fields, saving it from all narrowness or stagnation, that he may the more enjoy Nature's beauty, and the better make her forces serve him."

I do not feel like a stranger among you. Coming to this Western country forty years ago, in my boyhood and youth I shared the toils and privations of our pioneer life. I have rolled and burnt logs, and ploughed and planted, and hoed and harvested, amidst stumps and girdled trees, with the forests all around the little clearings.

I have sailed along the wild shores of your then new territory, landing at Milwaukee, when a few rude cabins were the pitiful beginnings of what is now a large and beautiful city. I landed flour in a small boat, lying off the mouth of Chicago river, when there was only a few houses, a ruinous warehouse, an old fort, and a miserable so-called hotel, on the open prairie where now rises another great city, and have always been glad of these my toils and trials, since they earned me the privilege of somewhat appreciating the laborious life of the pioneer.

My efforts have been, with yours, in this broad, western field. Much has been done, and more is yet to be done.

Let us go on, with faith, courage and unyielding effort, to build up, in your own State, and for our common country, a future in which labor shall be free and honored, genius and skill find ample scope in widely varied occupations, and farmer and manufacturer work out, in fraternal spirit and with a common purpose, the great problem of industrial independence.

AGRICULTURAL PROGRESS.

BY JOHN H. KLIPPART, OF OHIO.

No one who has lived in Ohio during the past twenty-five years will for a single moment doubt that agriculture, whether regarded as an art, a business or a science, is really progressive, and we have almost arrived at that stage when we can, with tolerable safety, indicate the character of the man by the appearance of his farm. The successful farmer has everything in appropriate order, and his crops are always good; because almost any Ohio soil, well managed, will always yield good crops, but the same soil, badly managed or indifferently cultivated, will yield a poor crop both in quantity and quality. It must be admitted that these are rather elementary principles, but our farmers are so very apt to lose sight of them that they cannot be too frequently repeated, whilst at the same time these principles embody all there is of Agricultural Progress.

The prosperity of a farm depends entirely upon the activity, intelligence, experience and the science of the farmer. The word or term, "science," is not introduced as equivalent to, or synonymous with, hypothesis or speculation, but in its true definition, viz: *ascertained facts;* for agriculture is really a science—is a thing of well-ascertained facts, notwithstanding many are engaged in it who make it a thing without a name, without any definite object or rule, and abandon it to the hazards of being controlled and directed entirely by routine. They acquire wealth not so much by absolute gain as the reward for their labors, as they do by a rigid self-denial and saving, which they are pleased to call economy, but which often proves to be more expensive than a very liberal outlay of money or labor would be. There are many fields where a good system of underdraining would produce double the crops that they now produce—would it not be economy to underdrain them? But the farmer says it is too expensive. Can he afford to be content with fifteen bushels of wheat per acre, when, with the same labor, he might have thirty by underdraining? Is not his saving, or economy as he calls it, a very expensive operation? He does not think so, because it does not take any of the money now in his pocket out of it, but it keeps much out that otherwise would go in.

There is a record of a Frenchman who believed that he had discovered the method of casting an entire font of printing type at a single cast. Such an invention would have been a certain fortune. He devoted an entire year to the construction of his machinery, and would not accept the advice or assistance of any master mechanics. But in order to operate his machine successfully he discovered that it was necessary to invent several other auxiliary or subordinate machines. One day a master machinist called on him and was almost stupefied on beholding the amount of money, time and labor, together with a veritable effort of genius, expended in an endeavor to invent three or four secondary machines, which really had been invented, improved and perfected more than twenty years previously.

The illiterate agriculturists are in precisely the same catagory with this inventor; they are expending the treasure of their brains and their hands in accomplishing anew that which has long since been known, recorded and described in many of the agricultural text books.

In agricultural affairs there is an endless chain of the relation of one thing to another. Wheat will not grow of itself—it must be cultivated to get good crop; it must be hoed like corn or potatoes, and well manured; in order to obtain manure we must rear cattle; to rear cattle we must have forage; therefore, if we want beef and wheat we must rear cattle, and on our good or bad management of these two things depends the greater part of our prosperity and happiness.

The great aim and object of County Agricultural Societies is for the encouragement and improvement of agriculture. The State furnishes a fund for this purpose, and county societies should see to it that this fund is not abused. Agriculture is progressive, and therefore the law-makers wisely left the fund to be disposed of by the societies in such manner as would best promote and secure the contemplated object. Now, it is a pertinent and yet a very delicate question to inquire if the managers of county societies have disposed of this fund in the best possible manner. What improvements in agriculture have been realized in consequence of this fund? Do we grow any more wheat per acre since establishment of county societies than we did before? Statistics show us that the wheat crop has been decreasing year after year since 1850, whereas it should have been increasing. Since 1863, Ohio has not grown wheat enough for seed and home consumption, the crops of 1864–5-6 being less than 10 bushels per acre. What bread crop has increased to take the place of wheat? Corn has not increased relatively; neither have any of the other crops according to the statistics annually collected.

Are we then to conclude that no improvement can possibly be made in the improvement of crops; or shall we conclude that county societies have not been as efficient as they should have been? No one, I presume, will for a moment doubt the purity of the intention of the managers of county societies, but they have not accomplished that which it was intended they would or could accomplish. For myself, I have no fault to find with the conduct of these societies, for experience has taught me that progress in agriculture is more difficult to secure than in any other industrial pursuit; and I am happy in bearing witness that these societies have accomplished *one* thing which perhaps could not have been accomplished in any other manner, viz: they have awakened a deep interest and secured attention to agricultural affairs; and we are now where we should have been twenty or thirty years ago, but even at this late day let us go to work vigorously and with a will, and show to the world that there is such a thing as *bona fide* improvement in agriculture. And here allow me to suggest how improvements may be made. At the county fair there are a dozen samples of wheat offered for the premium. A miller or wheat dealer is selected as chairman of that committee; he examines the wheat with a dealer's or a miller's view—knows its commercial or milling qualities and value, and accordingly awards the premium to the best sample. All this is right and proper—the spectators can see what kind of wheat is desirable in the market. The chairman makes an entry on the book opposite the number of the sample, "Premium." That is all the *record* there is of the matter, and all the knowledge gained is that *that* particular sample is more salable than the others. Who knows the name of this variety of wheat? Who knows how much it yielded per acre? Who knows whether it was drilled or sown broadcast? Who knows what kind of soil it grew on? Who knows how that soil was prepared, and what were the previous crops?

Now, is not all this knowledge just as necessary as it is to know which sample "took the premium?" This knowledge is absolutely necessary for the farmer; but the county society, whilst it cheerfully furnishes the money to pay the premium, takes no steps at all to secure this most needed information and to disseminate it when obtained. The acquisition and dissemination of this knowledge is a part and parcel of the duty of every county society, as I understand the law. The county society is to obtain this information, transmit it to the office of the State Board for publication in the annual report, of which 20,000 copies are printed annually. Then, too, the chairman of the committee should state, in writing, what are the special, particular or specific qualities of the wheat and why he awarded it the premium. It would be better for the county societies to exact such information from the producer and from the committee, because, then, no one would, or with any degree of propriety could, charge that the committee was influenced by personal or interested motives.

In 1852, the Ohio State Board of Agriculture offered a premium of $20 for the best crop of wheat not less than 5 acres nor less than 40 bushels per acre. The premium was not awarded that year, and in 1853 the premium was increased to $40, but failed to obtain a single applicant for the premium; not only that year, but also in '54, '55, '66, and '57. In 1858, Baldwin, Dewitt & Co., of Cleveland, placed at the disposal of the board one of Manny's combined Reaping and Mowing machines, to be awarded for the best crop of wheat not less than 10 acres, nor less product than four hundred bushels. This same premium was extended to 1858—both years failed to have a single applicant. In 1860, the premium offered in 1853 was again placed on the list, and up to this time, a period of 15 years, has failed to invite a single competitor. Why? Certainly not because 40 bushels per acre is not or cannot be grown, but because the growers do not care about answering the queries the board propounds. Every year since 1856, with the exception of '59 and '66, gentlemen have told me that if the board would dispense with the answers to these questions that the premium would undoubtedly be taken every year; and I have no doubt that it would. The board does not care to pay $40 to *know* that 40 bushels of wheat can be grown per acre, but the board is willing to pay that amount to know *precisely* how it is done, so that the information may be spread broadcast over the State.

Premiums are awarded and paid on fat cattle—those who visit the Fair see the cattle and know they are fat; but can any one, except the owner, tell how they were fatted and how much it cost to make them fat? The State Board ought not to award a premium on any animal which has passed out of the hands of him who bred it or reared it. I have frequently, at Fairs, asked questions of stock men relative to the history of animals they exhibit, and have been answered that they knew nothing of its history, that it was bred by Mr. A., and, in the owner's judgment, was a good animal. The young farmer goes to the Fair to see and to learn; how can he learn anything if there is no record of facts made—how can he learn from reports if the experience of others is not recorded? President Beckwith with, of the Michigan State Agricultural Society, very pertinently says:

"I am more strongly impressed than ever that much harm results to an agricultural exhibition when racing is encouraged. Nor can I see any good resulting from the adoption of any English custom which is not backed by the moral sentiment of our people; such, for example, as horse racing, or running horses through board fences. I have no doubt of the superiority of the thoroughbred horse, and would encourage their more general introduction among breeders; yet I do not see the necessity of a jockey race at a State Fair to show their action or test their powers of endurance.

"I would suggest, in regard to the classes of carriage and gentlemen's driving horses, that a rule be adopted requiring the owners themselves, in all cases, to drive and manage their own horses when competing for a preminm. In other words, to exclude professional jockeys and horse trainers from taking charge of and managing this class of horses when on trial and contending for prizes at our State Fair."

I have thus briefly referred to this matter of premiums to show that it does not accomplish all that it should do, but I very willingly give it credit for what it has accomplished, viz: it has created and maintained a spirit of emulation among the industrial classes which, without premiums, would have lain dormant until this day; and for the further purpose of demonstrating how difficult it is to obtain well authenticated facts in detail.

Our progress in agriculture depends entirely upon the accumulation and dissemination of authentic facts. The Germans and their descendants, the lowland Scotch, have made more rapid progress in agriculture than any other nation. They too encountered the same difficulties in obtaining *precise* and well authenticated information, and therefore adopted a different system, in part. They retained the system of prizes or premiums, but instead of having a miscellaneous exhibition, they held in one locality an exhibition of horses, in another, of cattle, in a third, one of sheep, in a fourth, one of swine, in a fifth, one of poultry, in a sixth, one of goats, in a seventh, one of dogs, in an eighth, one of agricultural implements and machinery, in a ninth, one of farm crops. The committees are paid for their services; their reports are able documents, and I am free to confess that I have learned more with regard to special topics from these committee reports than I have from agricultural text-books. Here in Ohio we practically ignore all committee reports. I mention these things, not in a fault-finding or captious spirit, but to demonstrate that in the present condition of things our progress must necessarily be very slow.

Since the discussions relative to an Agricultural College have been commenced, I am often asked whether I really think that education is of any advantage to a farmer. I always reply, "of more advantage to farmers than to any other class of community." In reply to this I have several times been told that Mr. B., of "such a place, commenced life an orphan boy, or a very poor boy, and even now can hardly write his name, reads no papers, never thinks of books, yet is a very shrewd man, a successful farmer, and is worth $50,000."

If Mr. B. made his fortune by ignorance, then we had better offer premiums for ignorance and abolish our systems of common schools. But tell me, if ignorance is the cause of success, why are not all ignorant men successful? It is industry and the prudent application of one's knowledge that leads to the accumulation of wealth, whether educated or not. Men endowed with special talents and genius ever spring up, or are born in all ranks and classes of society, and in all conditions of life.

Napoleon Bonaparte was one of these men; born of humble parents, he became the first military man in the world. The armies led against him were commanded by the ablest men of Europe combined—men who had studied military science as a matter of routine; generals who arrayed their men in line of battle, as did Charles XII of Sweden; as did Wallenstein; as did Frederick the Great, of Prussia; but with all their science, discipline and rigid adherence to precedent, could not defeat Napoleon except through treachery. He was a genius, and his education sharpened his natural abilities. And so with these very successful but uneducated farmers—they succeed by sheer force of industry and rigid application of natural ability, and who would adorn a more than ordinary place in any position in life which they may happen to be placed. Will any one deny that if these same men were highly educated that they would not have amassed much larger fortunes if money making is to be accepted as the standard of success? The great and very popular error consists in the fact that education and knowledge are regarded as synonymous terms. One may have much knowledge without any education or learning; and on the contrary, one may be very highly educated and yet have very little knowledge, and education is very little else than teaching us how to use, appreciate and classify knowledge; for knowledge consist purely and simply of what we *know*. Therefore, a man may know how to plow, how deep to sow; may know when to harvest; may understand or know all about a plant; which end of the wheat seed sprouts; when and how the wheat stools or tillers; may know perfectly well when a horse is sick and what ails him; may know how to breed and rear domestic animals, and yet may not know a single letter of the alphabet or the simplest rules of arithmetic. It is wrong to suppose that because a man has studied the "*Binomial Theorem,*" "*Quadratic Equations,*" and "*Conic Sections,*" that he necessarily is a successful breeder of mutton sheep; or because one has studied spherical trigonometry, astronomy, can calculate eclipses and make almanacs, that he necessarily can make a good sub-soil plow. But I will venture to assert that the man who has made these studies will be a more successful breeder, provided his taste lies in that direction, or a better plow maker, if his predilection should take *that* turn, than the man who has *not* made these studies. Because, these are very concise and intricate studies, and require the concentration of the entire mind during a period of perhaps many hours, and calls into active operation the most profound powers of the reasoning faculties. Now, this mental discipline and matter of the reasoning will, in after life, be habitually employed in all the avocations in which the student may engage. Education is nothing more nor less than a system of mental discipline, which teaches the use, value, relation and classification of facts, all of which either constitute or are derived from knoweldge.

I frequently suggest to some of our farmers the propriety of making some special improvements, which I am well satisfied would be very much to their advantage; but they almost universally reply that they are "*too poor.*" Suppose a merchant were to carry a piece of twine a foot long in his pocket, with which to measure the goods he sold, and if some one should suggest that a yard measure would save time, and be more correct, and look more business-like, and he should reply that he was "too poor" to get one, what would you think of him as a merchant? It is a melancholy truth that many of our farmers are in a much more ludicrous position. A farmer was one day pointing out a field to me, on which, he said, his wheat invariably "*winter killed.*" I found that at a depth of about four feet there was a strata of blue clay, or *hard pan*, as nearly impervious as a clay can be. I told him that the field needed underdraining: he replied that several had endeavored to get him to adopt some of the new-fangled scientific notions in farming, but, for himself, he believed the old plans were as good as any of the recent ones. I explained at great length the mischief which the hard pan caused; but he shook his head, and said he could not afford to pay $15 per acre for underdraining—that he never yet had grown a crop on the field that would bring $15 per acre. I failed utterly to convince him that drainage would do any good.

This same policy obtains throughout many of the farming operations, in one direction or another. The cattle breeders know that the best stock pays the best; but ordinary farmers will not get the best stock because it is too expensive. Has it ever occurred to these farmers that in a given series of years the common or "pennyroyal" is much more expensive than the shorthorns? The pennyroyal eat as much winter and summer, require as much attention in the winter, will not weigh more than one-third as much, and will not sell to the butcher for one-fourth as much. The amount that a farmer loses year by year on the inferior price and weight of common cattle, as compared with shorthorns, would in ten years give him a very respectable herd of shorthorns. The great error in Ohio is that we attempt to cultivate too much land. A German will purchase a tract of fifteen or twenty acres, and with no other capital than his brawny arms, goes "*to work;*" at the end of ten years he has a respectable sum of money to loan; whilst the American, even if he *inherits* that amount of land, as a general thing, is sold out by the sheriff before the close of ten years. Now, the soil is not partial; it yields its fruits in proportion to the pains taken to secure them; if the German is more diligent and assiduous than the native, he has reward in the increased product.

The sparse population of Ohio, and the great number of acres prepared for the plow, have rendered the invention of agricultural machines and implements an absolute necessity. It is a very gratifying fact to know that men with inventive genius have directed their attention to the necessities of the agricultural community, and that other men, with abundant capital, have invested, and are here in Ohio, permanently engaged in the manufacture of the best, cheapest and most successful agricultural machines and implements in the world. I feel myself warranted in speaking thus of

Ohio manufactures, in this direction, after having seen very many, if not all, the kinds of machines and implements used in Germany, France and Great Britain. The Ohio implements are lighter and more durable and elegant in design than those of Europe, but the workmanship is not so *fine;* we have less polish, paint and ornament than they have abroad. Now, with Comstock's rotary digger as a substitute for the plow; with the improved grain drills; with the perfected reapers and mowers; with the steam threshing machine; with the several cultivators, and other implements, such as hay-stacking machines, we can at least quadruple our agricultural force. In other words, suppose our active agricultural force consists of 250,000 men, or one man to every *ten* acres in the State, by the aid of this machinery, our forces will be equal to one million of effective men, or one man to every 2½ acres. This great employment of machinery is the secret of England's success, not only in agriculture, but in becoming the workshop of the world. Whilst England has a population of a little over twenty millions, yet this population, in combination with the machinery employed in every branch of industry, represents a working population or force of more than *four hundred millions of men.*

Now, to me, it is evident that our future progress in agriculture is entirely dependent upon the dissemination of agricultural knowledge, and the employment of the best labor-saving machines, in order to obtain sufficient leisure, in the first place, to obtain the requisite knowledge, and, in the second place, to have the labor better performed by machinery than it possibly can be performed by hand.

I am well aware that there is a strong prejudice against education. It is claimed that all the labor is educated out of the young men. I answer this question by asking another, viz: Do not hunting, fishing, horse-racing, and such like indulgences, take the labor out of the boys just about as rapidly as education possibly can? I ask the question, and challenge a negative answer: Has the education which the thousands have received at the German Agricultural Stations, Schools, Academies and Colleges, educated the industry and application of their abilities to the active pursuits of life out of *them?* I ask you: Have you ever found an educated German who was idle, lazy, trifling, or a loafer, in any rank of life? If industry and a disposition to engage in the active pursuits of life are inherent in a boy, all the education in the world will not take it out of him; but if he is naturally indolent, education will not make him industrious. Education simply develops the capacity of the man, and fits him more properly for the discharge of his duties.

It is the educated and intelligent farmer who visits the Fairs to see and learn which is the best machinery—to see and learn which is the best stock. It is the *ignorant* who reject machinery. Less than fifty years ago, the ignorant farm laborers of England banded together and destroyed all the farm machinery and implements, except the plow and the spade, in a county; and the weavers banded together and destroyed all the power looms. They argued that every threshing machine could perform the labor of ten men, or more; that every power loom performed the labor of six men, whilst one man could manage four power looms: thus *one* man only was employed where twenty-four *ought* to be. But as men become educated they appreciate labor-saving machines, and instead of destroying them, encourage invention and manufactures.

County and State Agricultural Societies have done much toward removing prejudices against, and to encourage the introduction of, agricultural machinery; and for this labor of love they deserve the sincere thanks of the agricultural community. But after having been instrumental in introducing labor-saving machinery, and the best breeds of domestic animals, it is now high time that these county societies take another step in advance, and that step is a very important and responsible one. It is nothing more or less than to convert the fair ground into an *Agricultural Experimental Station.* This will not necessarily destroy the grounds for the purpose of an annual exhibition, but will render them very much more attractive. The grounds should be laid out into plats: on one plat make experiments with wheat—thick and thin sowing, drill and broadcast sowing; deep and shallow sowing; experiments with once plowing, twice plowing, three times plowing, etc.; experiments in underdraining; experiments in the culture of grapes; experiments in the culture of potatoes—planting single eyes, planting whole potatoes, planting large or small potatoes, planting cut potatoes, planting in drills or in rows, planting in hills, etc., etc. Devote a sufficient space to strawberries, and in June have a strawberry, floral, and horse fair. Devote the requisite space to flowers and ornamental plants.

Keep a record of all these experiments from year to year, and they will be so much positive knowledge, will settle many disputed points, and save many thousands of dollars. There is no reason why the county society should not keep on hand, and for sale, all manner of useful and ornamental plants and trees, as well as all kinds of seeds. The county agricultural society is as much of a county institution as your court house, or any other institution you have. The officers of the county society are as much county officers as are the sheriff, commissioners or infirmary directors. The fair ground, thus conducted, becomes an agricultural practical primary school, of as much more importance to the young men and young women of the county than your high school, as intelligent industry and skilled labor is more important than aimless industry and brute force.

THE PERCHERON HORSE.

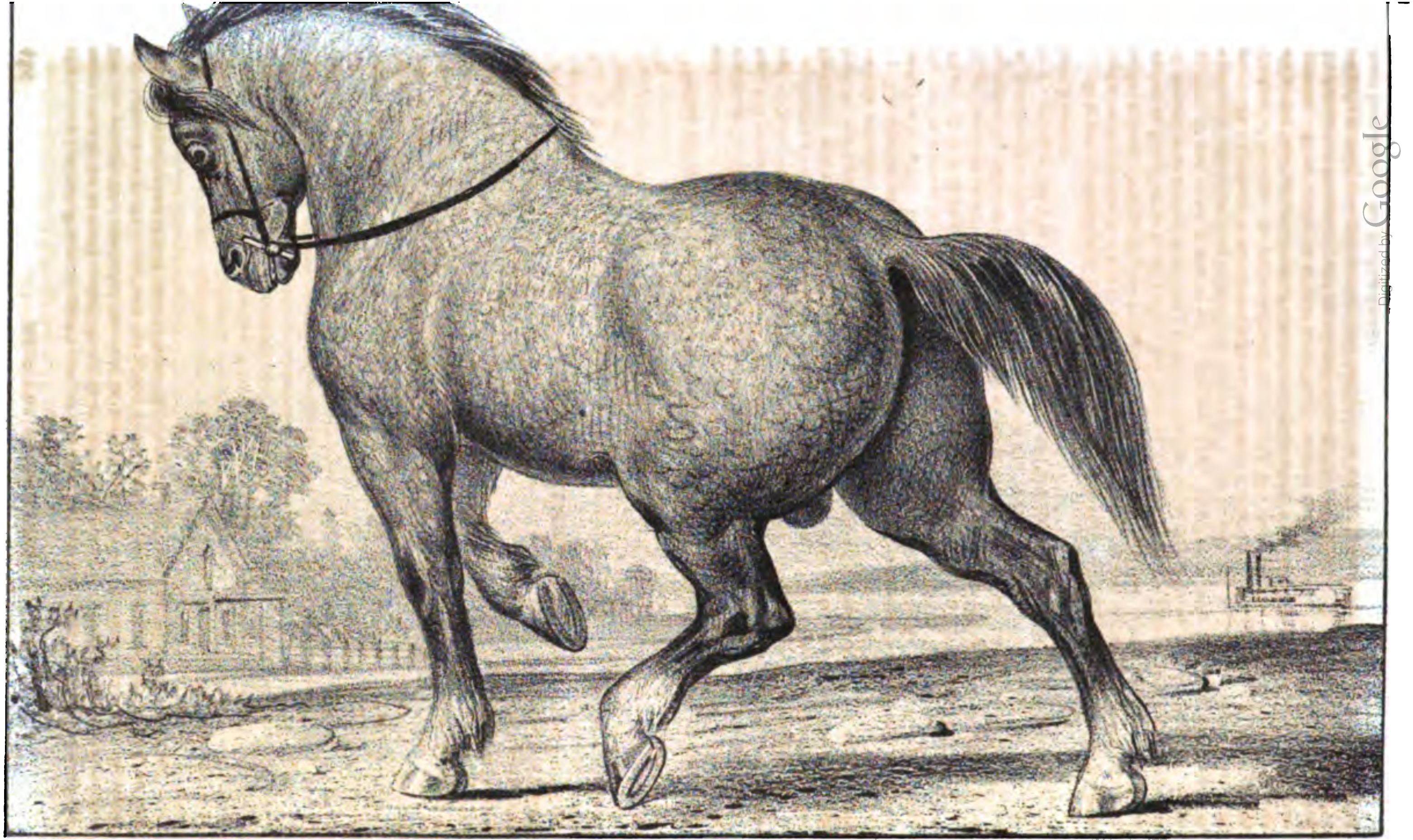
BY J. K. CLARK, ST. LOUIS, MO.

There are very few persons in the United States even among those interested in the breeding and management of horses, who are aware of the value and character of that breed known as "*The Percheron.*" The immense power, wonderful endurance and extreme docility of this peculiar animal, will render its introduction into this country an important advance in the art of stock breeding, while to the farmer his usefulness and strength will render him preferred above all others.

During a recent visit to France I was peculiarly struck with the beauty and strength of the Percheron, and made express inquiries concerning them and their management and breeding, and trust the information which I received will not be uninteresting to those who are engaged in agricultural pursuits.

The department of Perche is a small extent of country, about twenty-five leagues in length by twenty in breadth. It is bounded on the north by Normandy, on the south by the Vendomois, on the east by Beauce, including Chartrain and Dunois, and on the west by part of Normandy and Mame. It is in this beautiful country, where agriculture has flourished for years, where the beautifully meadows stretch far and wide, watered by brooks and rivers, and where the climate is remarkable for its salubrity, that the Percheron is found in his glory, and surely a more magnificent animal cannot be imagined than a well-bred Percheron on his native soil. Such were my thoughts in the spring of 1868, as I viewed him in Perche, and determined if possible to introduce the breed into Missouri.

It is not my intention in this brief paper to enter into the genealogy of the Percheron, but from historical deductions it is fair to believe that he is of Arabian origin, modified of course by climateric influence. "Mon. Eugene Perrault," says Du Huys, one of the most extensive and skillful dealers in fancy horses in all Europe, has frequently remarked to me, that of all the various breeds of horses, none were so interesting to him as the Percheron, and judging from his appearance and quality, *he was satisfied* that he was a genuine Arab, modified in form by the climate and rude services to which for years he had been subjected." There are many interesting historical facts, to prove this hypothesis to be correct, and among others I would allude to the defeat of Abderame on the field of Vouille. In this memorable engagement, it is reported that over 300,000 infidels were slain, and that the horses (all of eastern extraction) which they rode, fell into the hands of the conquerors. These horses, or at least a very large number of them, were divided among the men of La Perche and Normandy, and the country immediately surrounding. Again, excavations made as recently as 1861, revealed carvings and antiques on which, beyond doubt, the horses represented must have been of the Arabian breed.



A. M^c^ LEAN Lith.

THE PERCHERON STALLION, "NAPOLEON BONAPARTE,"

Imported from France, 1868, by Jefferson K. Clark, Esq., of St. Louis; is 17 hands high, and weighs 1670 lbs., very fast for this class of horse.

These horses, then, were gradually modified by the peculiarity of climate, mode of keeping, the labor they were obliged to perform and especially by the contact with the Britainy race of horses.

It may here be asked, what are the advantages which these horses possess? Allow me to state them as briefly as possible:

I. STRENGTH.

Let any stranger in France, whether he be a breeder of horses, or a student of metaphysics, stand in the streets of Paris, and see the enormous blocks of stone carried along with ease by a single Percheron, which in our country would require a whole team to move, and he will certainly be struck with amazement. Let him observe those omnibuses of immense size, filled to over flowing with people inside and out, moving at a rapid rate, drawn by two of these powerful animals, and he would certainly believe, that either *our* horses have degenerated or that vehicles and people too are not so heavy in France as in this country. It is surprising, in the extreme, to observe not only the weight which these horses move, but the apparent ease with which enormous loads are conveyed from place to place, and above all, it is beautiful to witness the docility and kindness of temper with which they bend themselves to their work. Of this subject a distinguished authority says: "Do you expect also from a horse, a horse derived from English blood, that cool, restrained and ever fresh energy, that courageous patience of which the Percheron every day gives an example in the omnibuses in the streets of Paris! Dragging at a trot heavy loads, the weight of which frighten the imagination; stopping short both in ascending and descending; stepping off freely and always without baulking; never sulking at his work or food, and fearing neither heat nor cold; this is a specimen of Percheron qualities." In London a traction of only about 2000 pounds is required of a draft horse. In Paris, the horses harnessed to the heavy stone carts are required to draw as much as 5000 pounds each, and often more. The testimony of Mr. Webb and Mr. Dickenson is to the same effect.

II. DOCILITY.

As a mark of the wonderful kindness of these animals, it may here be mentioned that stallions and mares are frequently worked together, side by side, without any effort on the part of the horse to become unruly or unmanageable. They are free from the usual faults of draft horses, always going "cheerfully," (if I may be allowed so to speak) to their work, and performing it with a gentleness that renders them beloved by all who attend them. They have been accustomed to work from the age of five or six month, and are most carefully handled by their masters. Rough usage is comparatively unknown in Perche, and this with the kindness and care of years extended to the breed, they naturally then become animals of great docility.

I have seen in one stable in France as many as eighty horses hitched to a rack, as many mares as stallions, and only a suspended board separating the two lots. This board was only about 18 inches wide and 8 feet long, hung from the ceiling with the two ends fastened with a cord, and clip spring in the rear to loosen easily if a horse should happen to stride it. None of the stables in Europe have stalls for the horses, except those of the Royalty. In Paris you constantly see 4 or 5 of these magnificent stallions hitched a la tandem, pulling their immense stone carts and often being left standing in the streets entirely alone, frequently one of the leaders will be turned around and two of them standing head and tail, so as to keep the flies from bothering them.

And either of my own stallions will allow you to go under them, sit on their hocks, or do anything with them you choose, they neither kick nor bite.

III. FREEDOM FROM DISEASE.

I am about to mention a fact under this head, which I know will be regarded suspiciously by many. Yet, it is, nevertheless, as true as remarkable. The Percheron is exempt from the hereditary bony defects of the hocks, and where they are raised, spavin, jardon, bone spavin, periodical inflammation and other dreaded infirmities are not known *even by name.*

IV. ENDURANCE.

As an example of this, I may be permitted to state that a gray Percheron mare started from Bernay, harnessed to a traveling wagon, and made the fifty-five and two-thirds miles, over a bad and hilly road, to Alençon, in four hours and twenty-four minutes; also, that a mare, seven years

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Two trials were made by Decidee, at Rouen—the first time in 1864, drawing 300 lbs.; he made it 9 minutes and 21 seconds; and the second time in 1865, drawing 408 lbs.; he made the same distance in 10 minutes, 49 seconds.

VI. ALL-WORK.

A horse of all-work is often "read about," but rarely seen. The animal we use for draft is not a comfortable horse upon the road. The good "buggy horse" or "carriage horse" is not fit for draft. The trotter is too delicate, and the runner is fit for nothing but his appearance on the turf. The Percheron combine qualities which render him a true horse of all-work; he will kindly draw immense loads, will get over the road at an excellent rate, will trot from dawn to dark with an ease and grace that surprises, and is most easily kept in excellent condition.

It was a careful consideration of these facts which induced me to import to Missouri this Percheron stock, and therefore at considerable trouble and no small expense, I procured two stallions and two mares, which to my great satisfaction arrived safely in the city of St. Louis. This feeling of gratification was enhanced on account of the misfortunes attending previous importations of horses from Europe.

The annexed wood cut (Fig. 2) represents one of these horses, and I cannot better introduce him to notice than by the words of the editor of the *American Agriculturist,* who was kind enough to look at his points and express them to his readers:

"This horse is five years old, 17 hands high, weighs 1670 lbs., of nearly uniform dark iron-gray color, and obscurely dappled. He is an animal of immense power, and very solid and heavy for his hight; not fat, and not in the least logy in his gait; spirited, but docile and gentle. The photograph not only represents the horse correctly, but also the yard in which he was kept for several days. White spots on his back and shoulders indicate old harness galls, and that, as a colt, the horse was put to hard labor. This is and for years has been the custom in Perche, and thus it is claimed, a natural selection of the best breeding animals is constantly made; for, of course, those, both horses and mares, which cannot stand the hard, steady work they are put to, are not used as breeders. Even the young stallions are constantly managed and worked by women, and thus, in the course of generations, a docility and mildness of disposition become inbred, which is one of the most interesting features of this breed. We are exceedingly pleased with the Percherons, and fully believe they are destined to be of great service to our agriculture."—*November,* 1868.

Not to be egotistical in reference to my own horse, I will simply insert in this place the remarks of the *Missouri Democrat* of June 27, 1868, and *Missouri Republican.* The *Republican* for June 7th, 1868, says:

"Early yesterday morning four French horses reached the stables of Messrs. Glasgow & Harkness, corner of Sixth and Locust. They are the property of Mr. Jeff. K. Clark, of St. Louis, who has been absent in Europe for a year or more. He purchased the animals in the south of France—two stallions and two mares. They are of the Percheron stock of draft horses, and are fine specimens of their breed. In color they are iron-gray. They are of fine size and breadth, and with remarkable power of muscle. When in full flesh, either of the stallions would weigh 1500 or 1600 lbs. The depth and breadth of chest, powerful loins and immense arms and quarters of these animals are such that one would not be extravagant to suppose that either of them could move a railway train with the ease of an ordinary locomotive. They could lift any load out of a mud hole, or bring the bottom of the hole along with it.

We understand that Mr. Clark's observations of this class of animal in France satisfied him that they would be a valuable acquisition to the breeding stock of this county and to Missouri. Large as they are there is nothing clumsy or unwieldy about them. They are spirited and stylish in their movements, treading with a step as elastic and nimble as that of the English blood horse. In France, with judicious crosses, they have been found quite as valuable for producing coach horses as those for heavy draft purposes. The mares brought over by Mr. Clark, we understand, were stinted, before leaving, to a celebrated horse of this breed belonging to the Emperor Napoleon.

We advise those having a fancy for stock of this kind, to go to Mr. Glasgow's stables to see these horses. They are not in the best condition, though they appear to have endured the voyage and the journey from New York very well. After a few weeks of care and feeding, they will look one hundred per cent better. By that time they will have acquired such a knowledge of English that they can appreciate the compliments sure to be bestowed upon them. At present they understand only French."

[From Daily Democrat of June 27, 1868.]

"PERCHERON HORSES.—We are always gratified to be able in any manner to promote the material interests of our State in all the departments of industry. And we take especial pleasure in noting any action towards the improvement of the breeds of stock. There is large room for improvement in this behalf, and particularly in the improvement of breeds of horses. It is true that there has been some cultivation of the finer stocks for the turf and light work, but little has been done to improve farm and draft horses. Improvement in this direction is of solid and permanent character, and such as must contribute to the material welfare of the entire community in which such improvement is established.

We are pleased to call attention to the fact that Jefferson K. Clark, Esq., has recently imported into this county from France four horses, two stallions and two mares, of the stock known as the Percheron in that country, the name being derived from the province of Perche, in which this breed of horses is particularly cultivated. The origin of this excellent breed horses is a question of some doubt, though the best and most reliable French writers on the subject trace its origin to noble equine blood. It is known from historical facts that in the eighth century many of the French crusaders returned to their country with horses captured from the Saracens, in Palestine, and that these horses were introduced particularly into Perche, and neighboring provinces. They were crossed with the native breeds of those provinces, until their descendants were losing the fine characteristics of their ancestry, and to preserve a superior breed obtained by such crossing, certain barons and gentlemen of the Province of Perche, and neighboring provinces, imported a number of stallions from Arabia. From this importation it is pretty certainly ascertained that the Perchean breed originated. The qualities of this breed of horses render them especially serviceable in heavy draft aud farm work. They are large, measuring from sixteen to eighteen hands, and show wonderful muscular power. They exhibit astonishing action for animals so large and heavy, and seem to inherit the powers of endurance of their Arabic ancestry. The French government is giving especial attention to the preservation and cultivation of this breed of horses, and has introduced them into service where heavy draft, endurance and speed are necessary to be combined. They are largely used in the artillery service, and are especially serviceable in diligence lines, where two of these horses draw an omnibus over the public highway at the rate of eight miles an hour, as required by the postal law of France. The time made by some of these horses is astonishing when their size and weight are considered. According to records of their performances in speed, preserved in France, they have trotted a mile in three minutes and one to twenty-one seconds.

And it is recorded of a certain gray mare that, attached to a tilbury, she made the distance of 55 14-66 miles, over a mountainous and difficult route in 4 hours and 24 minutes, averaging 12 9-16 miles per hour, or a mile in 4 minutes and 46 seconds. Another mare, on two successive days' trial, went 54⅜ miles in 4 hours 1 minute and 35 seconds, over a mountainous route, without the use of a whip, passing her stable door to complete the route.

One of the chief qualities of these horses is their docility and kindness of disposition. In their native country they are used and handled by women and children; stallions being worked and used with the same facility as geldings.

There is perhaps no other breed of horses combining so many qualities rendering them useful for draft and farm purposes, and so well adapted to supply a deficiency well understood and felt in this country.

Mr. Clark's attention was drawn to the superiority of those horses whilst in France, both by observation and reading the history of their origin and performances. Impressed with the want of so useful a breed of horses in his own country, he at once determined that his native State should have the benefit of their introduction, so far as he could make personal effort. Through the courtesy and marked kindness of the chief equery of the Emperor, he was enabled, after considerable diligence, and search to select the four animals mentioned above. They are of dark iron-grey color. The stallions are about 17 hands high, weighing between 1400 and 1500 pounds. Their movements are of astonishing ease and grace, and their carriage erect and spirited as that of a thoroughbred.

It seems to us that these horses would be of excellent service in our fire department, they combining the important qualities of weight, power, speed and docility. We have no doubt that the farmers and stock raisers in our community will avail themselves of the advantages of this introduction of a new breed of horses. It must be borne in mind that the Percheron stock is a distinct breed from the Norman horse.

COUNTY REPORTS.

COUNTY REPORTS.

BARTON.

Barton county presents inducements to the immigrant, at the present time, that are scarcely to be found in any other county of Southwest Missouri. Lands in this county are cheap, ranging in prices from $3 50 to $5 per acre. The soil is peculiarly adapted to the raising of wheat, oats, rye, and in fact all the cereals are grown here with success. All the fruits of the climate are cultivated with but little trouble and large yields. The coal beds of Barton are inexhaustible, timber plentiful, water pure, and abundant grazing for stock.

The climate, in common with the Southwest, is mild and salubrious. The air is pure, and has become noted for its health-restoring qualities; consumption has never been known to have originated here, while persons from other sections, affected with lung diseases, have been restored to health by a residence in this county.

The midsummer heat is modified by a constant breeze from the southwest, while the nights are cool, promoting recuperating slumber. Our winters are short and mild, stock very often living on the grass the entire winter through.

The interest on our school fund amounts to near ten thousand dollars per annum—a sum sufficient to run our schools, free of charge, for ten months in the year. Our society is composed of sober, energetic people from the North, whose industry has brought to Barton county three fold the wealth she had before the war. And yet there are thousands of acres of land, rich in every quality necessary to make gladsome homes for the husbandman, lying idle and unprofitable.

BATES.

Scarcely a day passes in which we are not requested to give some person an account of the soil, climate and advantages of Bates county. Many of these letters we have answered, but to save trouble in the future, we publish below an article prepared for the *Record* by our efficient deputy county clerk, Jas. H. Raybourn, Esq. It is an accurate statement, and will be found very convenient to mail to friends in other States.

Since the war, we presume no county in the State has been more prosperous, and in fact, no one has received the immigration, in proportion, as has Bates. In '66 we only registered 312 votes, while in 1868 the number of qualified voters was 1,510, while fully 500 persons now residing in the county are not eligible, either from not having resided in the State a year or being otherwise disqualified.

The following is the article alluded to:

Bates county is thirty miles square and contains 541,615 acres of land, all of which has been entered, except a small amount of school, swamp and reserved land.

The land and town property is valued at about $2,600,000; personal property $560,000, making a total taxable property of $3,160,000. The population of the county is about twelve or fifteen thousand, who have emigrated and settled within the last four years. The principal streams are the Osage and Marias des Cygnes river, and Miami creek, Moniteau, Walnut, Mormon Fork, Mulberry, Deer Creek, Deep Water, Panther and Mound Creek, which, together with their tributaries, afford generally plenty of water for stock; and on the rivers are many good sites for mills, manufactories, etc.

Water can be obtained on the prairies between the streams by digging from fifteen to twenty feet, generally through limestone; firewood can be had along the streams, and sells in our towns for from $3 50 to $5 00 a cord; coal is found in abundance, and of an excellent quality, can be obtained in almost any part of the county. We might say that Bates county is founded on a bed of coal, which is used in towns for fuel, except for cooking purposes, almost exclusively, and sells from twelve to fifteen cents per bushel.

Hedge, for fencing, does well, grows very fast, will make a good fence in three or four years from the time it is planted. Our nice and beautiful prairies are being speckled all over with large and well arranged farms, many of them fenced with hedge, with a cheap pole fence for protection while young.

Our climate is very mild and pleasant, the winter not lasting over three months; rarely have cold, freezing weather to last more than four days or a week at a time. Our farmers do not feed their stock more than four months, and those that live near the river and bottom range do not feed their stock very much if any.

Our springs generally open early, somewhat blustery and rainy through March and part of April, but we do not have the muddy and bad roads that others have who live where the ground stays frozen for four or five months at a time, and then thaws out all at once.

Our summers are warm, but regular and pleasant, especially after showers; evenings are generally cool.

Fall, as a general thing, is dry, affording the farmers every advantage for getting in their grain.

The soil is generally limestone, though in places it changes to a reddish loam.

Wheat does well, and we think by giving it proper attention, there can be an average of twenty-five to thirty bushels per acre realized.

Corn and oats do equally as well, if not better; vegetables of every kind do well, and there is a market for everything right at home. For a stock country, we do not think ours can be excelled.

Unimproved lands range in prices from $4 to $10 per acre, within the distance of three or four miles of town.

Butler has a population of 800 or 1000, is the county seat, contains six dry goods stores, two hardware stores, two grocery stores, one printing office, one jeweler's store, furniture manufactories, wagon and carriage manufactories, and blacksmith and wagon shops, one flouring and grist mill, and many other improvements; good schools, and prospect for better, all of which speak of the excellency of our county, and life and spirit of our citizens, considering that four years ago there was hardly a building in this town, nor more than fifty persons in the county.

Butler is a very stirring and beautiful town, situated on an eminence affording an excellent view of the surrounding country, which is as nice as the eye ever gazed upon. We have flattering prospects of railroads being built through our county, one of which is to run through the southern boundary of the county, the other from Holden or Pleasant Hill, on the Pacific railroad, centrally through the county and this place, to Fort Scott.—*Bates County Record, Nov.* 28.

CALLAWAY COUNTY FAIR.—H. BURT.

WILLIAMSBURG, Mo., Sept. 25, 1868.

The second day of the Callaway County Fair being the one devoted to the display of cattle, brought together the best assortment of cattle ever shown in the county, and especially thoroughbreds. Henry Larimore, as usual, was attending with his noted herd of unrivaled Short Horns, comprising all ages, and as usual carried off most of the premiums. His premiums amounted to over $200 during the day. Mr. Larimore has such an abiding confidence in the superiority of his stock that he has shown them everywhere in the State, and with almost universal success. He very frequently fails in meeting with the competition that he seeks. On this occasion he found a rival for the first honor. Mr. Samuel Hensley, who had just arrived from Kentucky, where he had been seeking for the best stock of that State that he could secure, entered the ring against him; and the cattle that Mr. Hensley brought with him need shame no one, for they are an acquisition to our county and to the State, but they were not equal to the task assigned them, for Mr. Larimore's took the premium. Mr. L. may well be proud of the achievement of beating some of Kentucky's best.—The only other contest that Mr. L. had was in the ring for two year old cows, in which the Hon. C. A. Bailey took the premium on "Fashion," which is one of the most superb animals of the cow kind. Mr. Larimore's celebrated cow, "Ida Lee," won all the prizes that she contended for, as she ever has heretofore, together with her calf, "Ida Lee 2d," which is as fine and handsome an animal as her mother ever was.

In addition to the thoroughbreds, there was a very excellent display of grade cattle. Hon. C. A. Bailey, Mr. Samuel Hensley, Mr. Crowson, and Mr. Samuel Grant were the principal exhibitors in this department. Mr. Grant was awarded the premium for the best bull, and Mr. Bailey received it for the best herd. His two year old heifer in this herd would have been a notable animal in almost any ring of two year old heifers. A heifer calf of this herd also attracted much notice, and the bull also was a good animal. There was a good display of steers. One remarkably large and well fatted bullock belonging to Mrs. Moss, whose weight was over 2,100 pounds, was shown in two classes, and went out with a red (premium) ribbon streaming from each horn. Mr. Jacob Maddox and W. J. Powell each had some very fine steers entered, and each took premiums in their class. The latter also took a premium on a large yoke of oxen. On the whole the cattle display was very creditable to the county. With no untoward events you may expect some of our Callaway thoroughbreds at your St. Louis Fair.

CEDAR COUNTY—ITS RESOURCES, &c.

We invite all into whose hands this paper may fall, and especially those seeking homes in a new country, to carefully peruse the following brief description of Cedar county. Do not casually glance over the different headings of this article and lay the paper by; but read the statements under each, and ponder them well—study it all over; and if after mature reflection, you think such a country as is here described would suit you, we say "sell out" and come "ahead" for there is no exaggeration, prevarication or misrepesentations—nothing but plain unvarnished truth in the following statements, every word of which we feel sure will be endorsed by all impartial persons capable of judging, after examining for themselves.

SOUTHWEST MISSOURI

of which an eminent writer, and one well acquainted with all its advantages and disadvantages has said "it is the garden spot of the West, and a land destined to be celebrated in song and story" is that part of the State south of a line running due west from Jefferson City to the Kansas line, and west of a direct line from Jefferson City to the point where the north fork of White River crosses the Arkansas and Missouri State line. It contains an area of about 17,716 square miles or 11,338,240 acres; four-fifths of which is excellent farming land, and underneath the remainder lies buried inexhaustible beds of various kinds of minerals ready to reward with wealth, any one with sufficient capital and enterprise to develop and work those rich leads. It produces nearly all the crops common to the Northern or Southern States, and most of them in great perfection. It has nearly all the native elements of independence, and we believe it could come nearer living independent of the rest of the world, (if such a thing should become a necessity) than any other section of country of the same size on the face of the Globe.

CEDAR COUNTY

is in the second tier of counties east of the Kansas, and the fourth north of the Arkansas line; has an area of about 437 square miles, or 279,680 acres of land. The eastern half of the County is a timbered country, with only a few small prairies; the western is mostly prairie, with belts of timber along the streams, and beautiful groves on the high-lands; in the distance resembling orchards, more than a grove of forest trees.

THE SOIL

Is of three classes, known here as the white ash, black loam, and red clay or mulatto lands; all of which produce well in favorable seasons, but the two latter are best for all seasons and crops, and yield abundant returns of all crops peculiar to this climate. The red land is peculiarly adapted to the growth of small grain, especially wheat and rye, and retains its fertility for 15, 20 or 30 years of successive cultivation, with very little, if any, decrease in the yield, and without the use of any kind of fertilizer; in fact, the use of fertilizers, as applied to this country, is a thing unknown, the the crops being always large enough to satisfy any reasonable desire, without them.

TIMBER,

black and white walnut, white, black and shell-bark hickory, black jack, sugar tree, common maple, red bud, paw paw, sassafras, hackberry, black and blue ash, birch, chinquepin, persimmon, wild cherry, sycamore, elm, hazel, box alder, shumac, mulberry, and all the different species of oak common to this latitude, and along the principal streams are found some cedar. The timber on some larger streams, and in some places on the highlands, is well grown, and of a good quality, but a great deal of the upland timber is of an inferior quality. This is not a peculiarity of the country, but has been caused by the ravages of fire, which annually kills a great deal of young timber, and scorches so much as to hinder the growth, and thus dwarfs a large portion of the remainder. Where the fire has been kept out timber grows up very beautiful and thrifty; and we have been shown places, where old settlers informed us, was prairie 28 or 30 years ago, and where now is to be seen a thick growth of tall, straight bodied timber, large enough for ordinary building logs, 10 to 18 inches diameter at the stump.

ROCK.

The great abundance of rock in our County, is an objection urged by some, new comers, especially those from sections of country where there is no rock on the surface. We believe, however, that this very objection will ultimately prove a blessing to us. Where the land is too rocky for cultivation it will produce grass and timber, both as necessary to the farmer as any crops he can produce, and there is not one acre of land in this County so rocky that it cannot be cultivated in fruit or grapes, crops, which, when an out-let by Railroad is opened to the Southern seaboard (which, by the way, will not be many years hence) will be a source of immense wealth to this section of country. While much of our best land has loose rock upon it which can be used in making fence, there is also plenty of land entirely clear of rock for those who prefer it. Lime and sand stone is abundant, and species known as the yellow and white cotton rock, which is excellent for building purposes, being soft, and works easy when first taken from the quarry, but, when exposed to the air a sufficient time, seasons perfectly hard. The latter is very white, susceptible of a smooth polish, and retains its color.

WATER.

is found in thousands of never failing springs, as pure as ever ran from the earth, and can be had nearly any where in the county by digging from 15 to 40 feet deep. The county is traversed by Bear, Cedar and Horse Creeks, Big and Little Sac Rivers, running North, and fed by springs furnishing abundance of water for propelling all kinds of machinery.

CROPS.

It must be borne in mind, that agriculture is in its infancy here yet, everything hitherto having been done after the old "pod-augur" system. The farmer labored under all the disadvantages of a new country, inconvenient to transportation, and as it furnished an easy support with the old fashioned farming implements, no effort was made to secure the advantages of modern improvements. But a new era is breaking in upon us; old-time ideas are giving way to the progress of science, and the result will roon be visible all over our beautiful South-West.

WHEAT

yields from 15 to 40 bushels per acre, though with the old fashioned way of farming here, the average is from 15 to 20 bushels, and has never been a failure within the memory of the oldest inhabitant. We can point to instances where men have bought farms and paid for them with two wheat crops, besides growing other crops and paying the ordinary farm and family expenses.

RYE.

Succeeds well, but is little cultivated.

OATS

Are sometimes injured by an early drouth, but generally yield large crops, and are extensively cultivated.

CORN

Is a sure crop, yields largely, and is the staple crop of the country.

MEADOW.

Timothy and clover both succeed well wherever tried, but from the fact that the wild prairies furnish abundance of free pasturage and hay for winter use, but little attention has been paid to those crops as yet. In the older settled portions of the country, where the wild grasses have been eaten out by stock, blue grass is rapidly taking its place, and ere a great many years, all our country that is not under cultivation, will be one unbroken blue grass sward.

TOBACCO.

As fine tobacco as is produced in the United States, (the most favored regions of Virginia not excepted) can be grown here. We have seen whole crops, the plants of which would average near five feet high after they were topped, and of very fine quality. In the summer of '67 we were shown tobacco which brought $20 00 per hundred pound, "the crop round," at the Springfield market, 70 miles from railroad transportation, while the highest price paid the same season at a railroad market in central northern Missouri was $6 00 per hundred. The above is not a single instance taken to excite the imagination; on the contrary such were quite common, and even higher figures than the above were obtained for extra crops. This crop can also be grown on the same soil for a long succession of years without exhausting the soil, as in many other portions of country, as has been tested by old tobacco growers.

HEMP AND FLAX

Succeed well, but are little cultivated.

FRUIT.

This is peculiarly a fruit country. Apples, peaches, pears, cherries, grapes, and in fact every kind of fruit peculiar to this climate, grow here in great perfection, and none of them have ever proved an entire failure wither the memory of that venerable individual, "the oldest inhabitant."

The peach, that most delicious of all fruits can be had in great abundance by all who will take the trouble to scatter the seed about their farms. The trees live to a great age, and for many years are thrifty and prosperous. There are bearing trees in this county now, that have been bearing 30 years, and look as though they might bear for years to come. There are peach orchards here that have become so thickly set with young trees, propagated from the original planting, that they more resemble a forest of small trees than an orchard; and the immense amount of fruit (there being at present no market here for it) is used by farmers to fatten their hogs.

WILD FRUITS.

The plum, blackberry, strawberry, raspberry, blackhaw, papaw, persimmon and grapes of two or three species are found in immense quantities. The large summer grape is very delicious, bears luxuriantly, is very regular in bearing, and hangs on the vine until late in the winter.

The persimmon is also found on the tree until late in the winter, and it is a rare treat to us to go into the forest and partake of those delicious dainties so temptingly offered when all other fruits are gone, except those protected from the icy hand of winter, by man's careful industry. The great abundance and luxuriance of the wild grape is a true indication of the success that would attend the cultivation of the tame grape; and there are hundreds of acres of land in this county, now thought to be worthless by some, that will yield a greater income from the sale of fruits, than will the land now considered to be the most valuable.

STOCK RAISING

Is the principal business, and the one from which our farmers at present derive the greatest amount of their income. Horses, mules, cattle and sheep, are extensively raised, and the short and mild winters, abundance of free pasturage, and the fact that buyers are always ready to buy up all surplus stock, make this a superior country for the enterprising stock grower. We would add, however, that our country is greatly in need of the improved breeds of all kinds of stock.

MINERAL.

Silver, copper and antimony has been found in various portions of the county, and the last two in considerable quantities; and indications of the existence of lead are almost positive also. But little has thus far been done toward developing the ore, and consequently our actual mineral wealth is, comparatively speaking, unknown. We might add, however, that it has been sufficiently tested to satisfy, beyond a doubt, those who are well informed on the subject of mining, that our mines are rich enough to pay a very large profit to any person, firm or company who have the capital and will invest it in mining operations. Perhaps we could not do better than give the report of an assay of 500 pounds of ore taken from the Hornbeck mine, three miles northeast of Stockton, made by a geologist of acknowledged skill and reputation.

500 POUNDS OF ORE

Smelted 102½ pounds Antimony.
" 91¼ " Copper.

Aggregate, 193¾

Aggregate market value in St. Louis in the month of June, 1868	$57 00
Cost of mining, smelting and transportation, @$1 50 per cwt.	2 90
Net profit	$54 10

Another assay of a different kind of ore by the same geologist, produced from sixty grains of ore, 20 grains of metal; two-thirds of which was stated by him to be silver. From the above, which we are assured is not exaggerated in any particular; it will be seen that a very large margin for profit is left; and we believe there are many capitalists who would eagerly grasp at the golden opportunity offered here, if they knew the facts as they really exist.

COAL.

Coal is found in various parts of our county, and in some places in great abundance; more especially in the western and southwestern part; and will doubtless in the far future be the principal article used for fuel in that section of country. At present the extent of our coal beds are unknown, as they have never been developed any more than what became necessary to procure coal for the blacksmith shops of the country. It is found in the banks of the streams and in many other places near the surface.

PETROLEUM.

The fact that oil can be had in paying quantities in this county, is not doubted by any one conversant with the indications. Oil springs have been known to exist here since the country was first settled, and in some localities, especially in the southwestern part of the county, the water is so strongly impregnated with oil in the fall of the year, or when the streams are low, that stock will not use it. The "Pioneer Oil Company" made up mostly of the citizens of Cedar, and whose headquarters is at Stockton, have leased considerable "oil territory" in this and Barton county, and are now drilling a well in the latter, and with a flattering show of success. At present writing they have obtained oil at the depth of 100 feet in small quantities, and are prosecuting the work with vigor.

STOCKTON,

The county seat has a population of about 350 inhabitants, a Lodge of Free Masons, Odd Fellows and Good Templars, one public and one high school, and several church organizations. Our merchants sell goods at a very small advance on railroad prices, and buy all kinds of produce at reasonable rate.

WANTED.

We want 500 new settlers, with either muscle or money for the capital, and promise them a hearty welcome among us, if they be good law-abiding citizens. We also want some one to erect a steam saw and grist mill at Stockton, a manufacturer of agricultural implements, a wagon and buggy manufacturer, a cabinet maker, a tailor and confectioner.

RAILROADS.

We are 90 miles from Sedalia, the nearest railroad point at present, and will soon be connected with it by a tri-weekly stage line. In 18 months or 2 years the Southwest Pacific will be completed (the work now rapidly progressing) to the State line, and will be within forty miles of us. Other roads are projected, and ere many years a pass will be made, for the spirit of progress is rapidly taking hold of the people.

HISTORICAL.

The territory embraced within the limits of what is now Cedar county, was first settled in the year 1833 by the Lindleys, Conners, and John Crisp. Mr. Crisp is still a respected citizen among us, and can tell in an interesting manner, many incidents and adventures of the early settlement of the country. The first settlement was made near Dunnegan & Montgomery's Mill, on Sac river, two miles east of Stockton, and a large sycamore tree furnished shelter for a part of that little band of pioneers until they had erected rude cabins for their better protection. The red man roved over the country in his wonted freedom, and wild animals of every description peculiar to this latitude, were found in great abundance. It was organized into a county in the winter of 1844–'45, the first county court was held at what was then known as Crow's Mill, near the mouth of Bear creek, and the first circuit court at the residence of Elisha Hunter, now know as the Neely or Clay Wells place, two miles south of Stockton, on the Greenfield road. This county was traversed by the rebels, in all their raids or journeyings north and south during the war, except Price's last; and of course was greatly devastated. It has also been the scene of several contests during the rebellion, and though the numbers engaged were small, the conflict was severe; and on one occasion when the rebels, several hundred strong, rushed in to take Stockton, a number of them were made to bite the dust for their rash attempt, and the remainder fled in dismay; they, however, succeeded in burning the court house in October, 1863.

Port holes are to be seen now in some of the buildings used by the citizens and militia as fortifications during the war. Our county seat was first named Fremont, but a few men in the county not liking Gen. Fremont's political position, managed to have the name changed to Stockton, in the year 1858, without the knowledge or consent of the citizens. Stockton was located on its present site, on account of several very fine springs, which is indeed a blessing to the town, as all the citizens will cheerfully testify, as they furnish water for the entire town.

LAND.

Wild land rates from $3 to $10, and improved land from $5 to $15 per acre.

SCHOOLS.

Nearly every neighborhood in the county now has a school, though our school houses are generally indifferent.

THE WINTERS

Are from one to two months long, and generally very mild, so much so that loose stock often winter themselves on the wild grass, which cures up in the fall and furnishes them nutritious food.

COME NOW.

We say to our friends to come now, while homes can be had cheap, and grow up with the country, get some of the increase in the price in land, that railroads will bring about. You may have to bear with a few inconveniences for a while, but a few years hence you will be none the worse off, and will secure advantages that cannot be had here a few years later without paying dearly for them.

JACKSON.

From copious notes taken during a lengthy sojourn in this county, I am able to give you the following description of this most attractive and interesting spot in Missouri:

Jackson county is about half prairie and half timber; a large portion of the timber is of the best quality, being large black-walnut trees, many of which are from four to five feet in diameter at the stump, and sufficiently long to make four "cuts" of rails. Water oak, white oak, ash, and red-elm grow to large size, and make ample timber for fencing and lumber. In many parts of the county saplings suitable for hoop-poles abound. Pawpaw and grapevines grow abundantly; the latter frequently attaining great size. Hazel, leatherwood, spice-wood, and sumach, line the edges of the prairies and form groves, where, in early days, stock was comfortably sheltered a large portion of the winter. The soil is as good for the production of corn, oats, rye, timothy, clover, fruit, tobacco, and hemp, as any section of land in the United States. The writer has traveled in some of the best portions of the Middle, Western and Southern States, but has never set foot on soil more productive or more easily cultivated than Jackson county, Missouri. Wheat yields well on sod-land. Every portion of this county is fertile, both timber and prairie. Lime exists in sufficient quantity in the soil, so do the phosphates and likewise potassa. The soil is sufficiently adhesive to resist the spring and fall winds, and rye and wheat are seldom disturbed by blowing storms. The soil is from a foot to four feet deep, and easily plowed; yet not so loose and ash-like as that of many parts of Iowa, and some counties in North Missouri. The sub-soil is a yellow clay, in most parts of the county, though on the slopes, and some of the timber, it is a red clay. Either is as good a sub-soil for agriculture or for health as can be found in North America. From fifty to eighty bushels of corn per acre have been produced in an ordinary season; and in the best years, with first-rate culture, a hundred bushels have been grown; and in one instance a whole field averaged *a hundred and fourteen bushels* to the acre.

A fine market has existed here for many years for bacon, corn, and pasturage from the Santa Fe trade, which brought in many teams to be fed during the fall and winter. That most excellent fall and spring pasture—the blue grass—is an indigenous growth, and grows as finely, and lasts as long here as it does in Central Kentucky or in the hills of Western Virginia. The mechanical nature of this soil allows the long tap-root of clover to penetrate to an unusual depth, and secures to it moisture in a dry season, and insures a luxurious crop of this valuable grass every year. Melons, sorghum, and garden vegetables yield here in great profusion, and are never neglected by the farmer.

The surface of this county varies from gently undulating to rolling. In three or four places it might be called hilly, though the "hills" are but gradual slopes, not any too steep for farming. There are four large creeks in the county, affording stock plenty of water, and a few good mill sites.

Some good lime rock is found on the surface in many places, and excellent quarries exist a few feet under the surface, which yield all the rock that will ever be required for buildings in the county, as well as for a large portion of the farm fences.

Jackson county contains about *five hundred square miles*, and has a population of upwards of thirty thousand. The people are ambitious, enterprising, and intellectual, as much so as can be found in the best counties of Southern Ohio or Central Kentucky. The ladies are refined, educated and beautiful, as a rule. They ride much on horseback.

This county was first settled about forty years ago, by immigrants from Kentucky, and settled up quite rapidly. The Mormons under Joseph Smith and Sidney Rigdon located near the center of this county about the year 1835, and remained a few years, but were driven out by the inhabitants for alleged depredations on property. Many springs are found here affording the best of water for house use. Good wells are made by digging from twenty-five to fifty feet, and, as I have said, plenty of rock exists to wall them.

Kansas City, one of the largest small cities in Missouri, is located in the northwestern corner of this county; its present population is variously estimated at from fifteen to twenty-two thousand—I would state it at full fifteen thousand. It is handsomely located on the south bank of the Missouri river, at its great bend. Lines radiating west, southwest, south, and southeast, might be drawn, extending thirty to forty miles over as good an agricultural country as exists on the American continent, fertile, healthy, finely varied with timber and prairie. Clay for brick abounds, and rock for turnpiking. This area of country would embrace six or seven large counties, and is the largest tract of first-class soil with equal advantages in North America. Between 1850 and 1860 it was settled up very rapidly by a first-class people, bringing refinement and high civilization with them. This region of country, and Jackson county in particular, was badly injured by soldiers in the late civil war, and has not recovered from the devastations of that period. From Kansas City will soon radiate many railroads, turnpikes, and wagon roads; some westward, one of which is now built beyond Fort Riley, some southward to Matamoras and to Galveston, and others southeast to Memphis, and to the great cotton and sugar region of Louisiana. In a few years this must, as a necessity, be done; and then Jackson county, and surrounding region will be the most attractive and luxurious portion of our State.

Independence, a beautiful town of full four thousand inhabitants, is the county seat, and is handsomely laid out, and built of brick. The dwellings and public houses are handsome and regular, the streets macadamized, wide, and shaded with trees. As fine society as can be found in our State is found in this proud and cultivated town. It is the pride of the county, and the county might well be the pride of the State.

Westport is a good-sized village twelve miles west of Independence, and situated three and a half miles south of Kansas City, and one mile and a half from the west line of the State. Westport has been for many years one the chief points of the Santa Fe trade, which has so much enriched our State. Once viewed in the spring, summer, or fall of the year, Jackson county makes an impression on the mind never to be effaced. One associates life here with all that is noble and chivalrous. A little strange to tell, the society of Jackson county is quite homogenous.

When the railroad shall have been completed from this county to that Eldorado of Spaniards and Anglo-Americans, California—which Hon. Waddy Thompson, Minister to Mexico, called "God's own country"—it will open an epoch in the career of the two regions that must be memorable and lasting as the philosophy of history itself.

The present crops here are excellent; wheat and oats are particularly good; corn, as usual, is very good, and grass is luxuriant.

JASPER—E. M. Burch.

I thought I would drop you a line to let you know how spring is opening in the Southwest. The weather is clear and warm, with occasional showers. Our farmers are through sowing oats, the only seeding we have to do in the spring, as we don't raise spring wheat; winter wheat we think makes much better flour, and is a more certain crop. The peach trees are in full bloom, and the prospects are favorable for a full crop. Apples, plums, cherries, gooseberries, and strawberries, are in bloom, with favorable prospects for a full crop. The elms, hackberry, and redbud timbers are putting on their summer dress. In fact our forests are beginning to look quite summer-like. The gardens are looking fine; most of garden vegetables are up, and large enough to begin to cultivate—such as potatoes, onions, peas, beans, beets, etc. Our prairies are looking finely, covered in beautiful green grass and flowers. Our herds of young cattle and horses are out on the range, feeding themselves. Many of the farmers are nearly ready to plant their corn. Some few of them have planted a portion of their crop. Our farmers are preparing for large crops, with a view of meeting the demands of a large immigration, which threatens us from every quarter.

There are many gentlemen in our county from various portions of the north, east and south, looking at our country; and all agree that Southwest Missouri presents greater inducements to those wishing to invest in lands than any other portion of the West. The mildness of climate, the fertility of soil, the cheapness of our lands, the great number of fine springs and clear running streams, and our noble river running through our county from east to west, taking a somewhat circuitous route, giving us at least forty miles length of river in our county, with nearly as many good mill sites.

We are in want of manufactories of woolen and cotton goods; and, in my opinion, there is not a section of country in the Union where an investment of the kind can be made more profitable. It is admitted by all Northern wool-growers that we have the finest wool-producing country in the United States. We have about twelve thousand head of fine wooled sheep in our county. Large numbers will be driven in this summer from Iowa, Illinois and Ohio. We hope and expect that among the many that are seeking to invest profitably, this great manufacturing enterprise will not be overlooked. Certainly manufacturing could be done as cheaply in our county as in any part of the West; while the manufactured goods would meet with a ready sale at home.

The lead mines of our county are superior to any in the State, proving richer even than the celebrated lead mines of Granby, in Newton county.

Southwest Missouri presents a rich field for the horticulturist. There is not a well-established nursery in this section of the State. The growing demand for fruit-trees is very great. Thousands of farmers that are now opening up new farms are in want of fruit-trees. None are to be had nearer than St. Louis or Illinois. The inconvenience of obtaining them prevents hundreds from planting out orchards that otherwise would. We hope some one of experience will come to our relief.

The prospects for railroads to this portion of the State are cheering. The Missouri and California Railroad will be built to the western border of our State speedily, and near the border it will intersect with the Chicago, Kansas City and Galveston road. We also will have a road from the north, known as the Tebo and Neosho road, which will pass through our county seat, and intersect the Missouri and California road at Neosho, in Newton county.

The Tebo and Neosho road gives us a direct line of communication to Chicago, thereby giving to the people of Southwest Missouri their choice in two of the great marts of the West. Cotton can be profitably cultivated in this section of the State. Many of our farmers cultivate it in small patches for their own use, and superior in quality.

JEFFERSON—W. S. JEWETT.

Since my last report was made another year has rolled round, and many ups and downs in this world of tears has taken place, and all, both great and small, have cast their shadows for good or evil, and time only will tell which may preponderate.

The past year, although one of general prosperity, has had many drawbacks, causing loss, vexation and disappointment to those on whom they fell. The season was rather an unusual one in the extremes of wet and drouth. The spring was wet say until the first of June, when it ceased and was dry until the latter part of August, when it set in wet again and continued so until the first of October, since when we have had splendid weather for farm purposes.

The wet in the spring retarded the planting of usual crops, and such as were got in, were poorly cultivated, when the dry season came on they could not withstand the heat, and suffered greatly. But the worst calamity that befell our county was the grand army of chinch bugs, they appearing in all places and in all directions, covering the wheat, corn and sorghum in endless numbers, sucking the life out of every green thing not impervious to their voracious thirst. They caused the most injury where the soil was thin and crops suffering from drouth, in fact, on such spots they killed the crops entirely, while in the valleys and richer portions, and where occasional rains fell, the damage was but little, and while on this subject, will state that our own wheat, that was cut the first day, although rather in the dough state, made fair and plump grain, while that ripened standing, was shrivelled and chaffy, showing that bugs injured it more than the cutting of it green, also one piece of nearly four acres that was sown to timothy (and the last that was cut) was of good grain; also a piece that was rented out and sown with wheat full of cheat, so much so that before cutting it appeared to be all cheat, and when cut some two weeks after the first (it being a mixture of old late varieties), the grain was a No. 1., the grain being large and heavy, showing that the timothy and cheat were a protection, the bugs working on them instead of the grain. Why the bugs were so plentiful here, where never known before, I cannot surmise, unless on account of the season of '67, was propitious for their development being dry.

We also had another pest to visit us, the seventeen year, or rather the thirteen year locust, they having been here in '42, '55 and '68. Think they were more numerous and destructive than ever before. On all wood lands, and where cleared since their last decade, the ground was literally perforated with holes, from which they came out of the ground, and when most numerous, their constant din was anything but pleasant to the ear. The damage to large timber and old orchards is not very serious, but in young ones recently planted, the trees being small, the bodies and limbs were much gouged and split up, causing a bad place in the tree, from which decay will set in and cause them to be short lived.

And while on the bug question, will state, insect enemies of all kinds appear to be on the increase. The Codlin moth, borer, both apple and peach, and the curculio, have increased at a rapid rate, showing that we must awake to our interests and combat them if we wish to successfully grow crops of grain and fruit. Observations have convinced me that the borer and moth are worse on high lands than on the low and richer bottoms, whether on account of the high situations, the air is more light, warm and dry, suiting their natures better for outdoor exercise at night, when propagating their species, is a question for our Entomologist to decide. It would be well for all to observe the workings of various insects, to know friend from foe, conferring with and sending specimens to our State Entomologist (C. V. Riley), that he may give us the results of his experience, and by so doing he will greatly assist him in his arduous duties, as one person can accomplish but little in a scope of country as large as our State covers, unless he gets the help of others. Many localities will be visited by as many different insects, and of which he can know nothing unless informed by those interested. And while on the bug question, would like to get some information in regard to non-swarming of bees during the existence of the locust. They appeared to swarm and do well until the locust appeared, when they ceased at once to do so, no more coming out until after they left, when a few small, late swarms came out, of but little value. Wasps, hornets, bumble bees and yellow jackets also were few and far between.

Wheat crops were poor on account of improper cultivation; bad winter, (having but little snow), wet spring, rust, chinch bug, etc.; some crops yielding 25 bushels per acre, while some were not cut at all, and many did not pay expenses of cutting, threshing, etc.; yield on an average not more than 8 bushels per acre.

Oats, not many sown, and crop light on account of hot dry weather succeeding a very wet spell.

Corn crop generally light from drouth and chinch bug ; yield on an average not more than 12 or 15 bushels per acre.

Irish potatoes : Early ones generally of but little value, except a few favored localities, and those having the earlier varieties, York, Goodrich, etc.; where planted late, and properly worked, so that they received the benefit of fall rains, they were fine; yielding well, and potatoes of large size, though skin a little tender from quick growth and late season.

Sweet potatoes : Good where well cultivated, the dry weather affecting them but little after getting a stand of plants.

Sorgum culture is on the decrease, the last few seasons having been unfavorable, and with poor facilities for manufacturing ; the cheapening of Southern sugars has caused the interest to be neglected.

Turnips, where got in, in order and time, were large and fine.

Meadows were very good, from wet spring, but there is scarce enough sown to grass, to supply home demand, without any to export.

Apples were almost a failure, as they did not appear to set well, and a large portion that done so, dropped off after getting the size of bullets; what came to maturity were greatly injured by the codlin moth, or apple worm, and worse than all, many of the fruit-growers are complaining of their apples being stolen by petty thieves, at least that was my experience, while absent at the great St. Louis fair, the nights being fine (by a full moon), all my fine ones were gathered, saving me that small job.

Peaches were a poor crop, except in favorable situations, where protected by river, high locations or sheltered by timber, buildings, etc.; having fine open weather during the first and middle of March, and afterwards 26th to 28th, while they were in full bloom, a cold snap, commencing with a cold rain and sleet followed by a freeze, caused almost an entire failure; of what few escaped the frost, the early varieties were much injured by the curculio.

Grapes were generally good, the principal complaint being the very low price at which they are sold in market; the great success with which the grape is grown in this county, is attracting many here, and large number of vineyards are planted yearly, and old ones increased in extent. For results and further information I refer you to report of Isidor Bush to State Horticultural Society.

Bush & Son are located at Bushburg, on Iron Mountain railroad, and are among the many enterprising ones recently come into our county. They are propagating largely of the finer kinds believing that our county is admirably adapted to their growth.

Our agricultural association commenced to hold its annual fair on the 23d of September, but as it had been raining for several days before, and on the morning of the 24th it set in with a slow drizzling rain, rendering out door business disagreeable, and exercise in the ring almost an impossibility on account of mud on the track, even if the stock had been in attendance, the lack of which was caused by our county being broken and hilly, the recent rains had rendered the roads bad, and many of the creeks were past fording, or nearly so, rendering the amount of stock on exhibition small. The board of directors held a meeting and decided to postpone the exhibition until October 21st, 22d and 23d, and until fairer weather; after passing upon fruits and perishable articles, At continuance we were more successful in weather, but the attendance was not so large as the time was after the St. Louis and other fairs, and the community getting tired of the excitement, and having lost much time through bad weather, fairs and politics, were compelled by their more pressing wants, especially as many had not finished seeding or gathered their fall crops, with the near approach of winter. The result of all these mishaps was attendance limited, and display of stock, implements and products were meager.

The number and amount of premiums were quite liberal, and receipts did not meet them and expenses, but the board decided to settle all demands if it took the last farthing and appropriated money on hand, borrowing sufficient to pay all premiums. While speaking of fairs, will state that our society was organized under the general State law and adopted Constitution, as recommended by State Board in 1865, with a few amendments suitable to our locality. But with the experience of nearly three years am satisfied that the joint stock principle is better adapted for the successful working of county organizations, stockholders taking hold of it with a will, and being situated all over the county will stir up a general interest in it.

Our horticultural society continues to hold its monthly meetings, which are generally well attended, the larger portion of members taking a lively interest in the subject, a large portion of which are new beginners, and appreciate the benefit of mutual exchange of opinions, thereby assisting one another.

Our county is still rather behind hand in public conveniences, especially schools, churches and roads. The townships are not all fully organized under the present school law, some of them being so situated that it would work great hardship to do so. Several special districts were organized under the old law by making them out of parts of two or more townships, when the law now steps in and divides them up according to congressional township lines, destroying their unity and usefulness. In parts of the State where the county is level, and districts well inhabited, it may work well enough, but where, like ours, divided up by high hills and impassable creeks forming natural boundaries, it often happens that the children in a whole township are isolated, and makes it inconvenient to get up a school. The law, as it now stands, is not working as is intended, and it is hoped the next Legislature may right the evil.

Considerable progress has been made in roads and building bridges, but there is yet room for improvement. We have two rock or macadamized roads started with several branches and cross-roads in view, which will be completed as soon as our county fathers can see from whence the wherewith is to be had. Three large bridges have been built this year, and one or two others contemplated. One of the great difficulties in the making up of estimates for public purposes, is the uncertainty of the tax or assessor's books.

Our present revenue law may have been a good one in early times when land owners were few and far between, and land of but little value, but now when it is all taken up, increasing in value fast, it is well to look after the taxes. All property is assessed to owner's names in alphabetical order, when by chance any assessor or other person in transcribing the books should make an error, the property cannot be found, or possible it may be assessed to a half dozen or score of individuals, all of which refuse to pay taxes, and it is advertised as delinquent and sold, unless the mistakes are accidentally discovered. All causing expense and lessening aggregate of revenue.

A more suitable way and much less trouble would be to have it assessed by section, township and range, and lot and block (in towns and cities), being made out similar to abstract books (congressional entries).

The latter part of the season money matters have been close, but things are still prospering here, improvements are going on on every side, clearings made, orchards and vineyards planted out, fences built, barns and dwellings erected, with a better mode of farming exhibited everywhere. Real estate is holding its own in price, though not as many transfers as a few months since, but when spring opens again, I believe there will be more than the usual amount of sales effected, as many of our large tracts are being divided up to meet the large demand for small tracts. I might have given something more directly in regard to agriculture, but had but little leisure and could get no statistics.

LIVINGSTON—ITS RESOURCES AND PEOPLE.

CHILLICOTHE, Mo., July 27, 1868.

A letter from so interesting a section of our State as this—the Grand river region"—it is hoped may prove entertaining to readers in many portions of Missouri, as well as to those in other States. There are five or six counties drained by Grand river, and lying in a group between the Missouri river and the Iowa State line, which are properly enough denominated the "Grand river region." The one I shall now speak of is Livingston county, in which Chillicothe, the county seat is situated. Livingston is in the second tier of counties north of the Missouri river, and is bi-sected by the Hannibal and St. Joseph railroad; which highway was completed from the Mississippi to the Missouri rivers in 1859. This county, in appearance, has a fertile, loose soil, but is less productive than Eastern farmers at first estimate it to be. It is not, however, a poor or unproductive soil, for it yields, on an average, forty to fifty bushels of corn to the acre; and this year has yielded near twenty bushels of wheat per acre, and a heavy crop of potatoes, oats, grass, and garden vegetables. The wheat is not so heavy a yield as it was estimated before harvest, the berry, or "grain," being a little deficient in development, which will reduce the weight per bushel below what was expected.

This might be called a prairie county, though one-third of its surface is covered with timber. The Grand river passes through from the northwest corner of the county to its southern line, about midway from its eastern and western lines. The "bottoms," or valley ground, along this river are from three-fourths of a mile to three miles in width, averaging about a mile and a half. They are of the most fertile quality, and are thickly covered by a high growth of timber. Three-fourth of the valley on each side of the river overflows nearly every year, and is consequently nearly useless for agricultural purposes while without levees. There will, I predict, be constructed, some future day, levees on each side of this stream to prevent it from overflowing the valley each side; and then thousands of acres of land as rich as the valley of the Nile will be ready for cultivation in hemp, tobacco, and all kinds of grain. The timber along this stream and its tributaries is excellent for building and fencing; and the grazing for stock is protected from the winter freezing a month later than on the adjacent prairies. The banks of the river, or rather the small hills, that divide the upland from the valleys are from twenty to fifty feet high, and frequently so gradual a slope as to be scarcely recognizable. After ascending these slopes from the bottoms we enter small thickets of sumach and hazel, and continue in them from a few rods to half a mile, when the prairie sets in, and covers the surface of the country from the margin of one stream to another, and constitutes about two-thirds of the area. The brush land, or hazel thickets, when cleared out, make the best of land for grain and tobacco.

Livingston county has a rolling but not hilly surface, and is admirably adapted to grain growing, pasturing, tobacco raising and fruit. Beneath the dark alluvial surface, from eighteen inches to two feet, begins an adhesive, hard, whitish yellow clay sub-soil, holding in tight embrace many pebbles. This sub-soil is termed by the inhabitants a "jug clay," and is poorly adapted to the transmission of water; it is not so good a sub-soil for the cereals, tobacco, or fruit, as the yellow clay, or the red clay of some sections of South Missouri; yet fair grain is grown on the surface over it, with moderate labor. The well water here for house use and for stock raising is passably good. The streams afford stock water all the year round. Clover, timothy, and blue grass grow well here, and produce good pasturage from seven to eight months in a year. It is claimed by several of the oldest inhabitants of this county that the longest blades of blue grass ever grown in the United States grew on Livingston county, Missouri soil. Apple trees thrive well here, and nearly every year they produce a crop of apples; though peaches are frequently killed by spring frosts.

Writers on agriculture commonly describe the good qualities of a section, and say but little about its deficiencies and demerits; but I will say at once that this county has one prominent defect, viz., the soil has not sufficient lime in it. If it had as great a proportion of lime as Jackson, Ray, or Lafayette counties have, it would be from a third to one half more productive than it is. The importation of lime and some potash to this soil, and sprinkled lightly over the surface every few years, would not only add greatly to its productiveness but would render the surface more adhesive and "waxy," and prevent much inconvenience from the moving of its surface by severe winds. One-fourth of the outlay in lime applied to the soil here that farmers in Maryland, New Jersey, and North Carolina spend in guano would cause it to produce fifty per cent more grain, of every kind, and of wheat more than a hundred per cent. The material for making lime is deficient in this region; but a new railroad is being laid out from Brunswick to Central Iowa, that will pass through the center of this county, and will, when built, afford good facilities for importing lime.

The county seat of this county, like nearly every other thriving town or city in the Mississippi

Valley, is too large for the amount of farming that is done in the surrounding country. The county has a population of about eleven or twelve thousand, and the town of Chillicothe contains between four and five thousand! There is not farming enough done in the United States, and the tendency of our people to congregate into villages and cities is increasing every year. Agriculture, in many sections of our country, has been for many years in high esteem as an occupation: but in many others it has been looked upon as inferior in tone and respectability to the professions. It will ere long rank with the learned professions, and then that overgrown thirst for professional life, which has been developing in the United States for many years, will be checked. Young men of education will, and ought to, seek employment in what Washington, Franklin, Jefferson, Harrison, Webster and Clay expressed themselves as believing to be the most noble occupation of man. There are thousands of talented young and middle-aged men in Missouri who are living to very little advantage in villages and cities, who would increase their comfort and happiness by going on farms in the country; and they would also add to the general stock of knowledge, useful literature and wealth. The farmers of this State are not deficient in refinement, culture, talents, in truth they are the intellectual stamina, sound sense, and moral worth of our State, as a class.

Two-thirds of the inhabitants of Livingston county are farmers, or the families of farmers, and are a superior Western people, having directly immigrated, or their fathers before them, from Southern Ohio, Pennsylvania, New Jersey, Delaware, Maryland, Virginia and Kentucky, and brought a high civilization with them, and have retained it. There is here, as well as throughout the State, a great deficiency to supply, to which I will not now further allude, but will promise to elaborate upon at a future day.

The high rates of transportation from this point to the Mississippi river, as well as to St. Louis, retard the prosperity of agriculture. At least twice as much has been charged heretofore for transporting wool, pork, beef, grain and tobacco as farmers could afford to pay. Many men of good judgment here have openly declared that a railroad is no advantage to the farmers of Central Missouri; they say the old way of wagoning was cheaper, though far more tedious. The Legislature would do well to fix the rates of freight by law on railroads, and thus protect the farmer, who has, in many instances, contributed to build the roads. Farmers are the virtue, the intelligence, and the great source of wealth of the State; and, although no special legislation should be given to any class of persons, yet each should be protected from extortion from others.

Show me a country anywhere on the face of the globe, either in ancient or modern times, whose chief wealth and leading business was agriculture, and I will exhibit to you a people, proud, brave, intelligent and virtuous. The people of a farming district form a great contrast with the inhabitants of a commercial city, in this, that the former are better looking, more honest, more pure hearted, and have a higher order of intellectual endowments. The latter are shrewd, more active, keen, narrow-minded, licentious and short lived. It has been remarked by many writers on statistics and political economy, that cities would finally degenerate into a weak and worthless class of inhabitants were it not for the fact that they are constantly reinforced by healthy, efficient and vigorous people from the rural districts. It is high time that the emigration was reversed, and the depraved and run down ones of the city taken to the country to revive, and outgrow their city weaknesses. M.

MONTGOMERY—Thos. J. Powell.

New Florence, April 1, 1868.

In conformity with the provisions of the General Statutes of the State of Missouri, relative to county agricultural and mechanical societies of the State of Missouri, the board of directors of the Montgomery county agricultural and mechanical society of the said county of Montgomery, respectfully make the following, their first annual report, and submit it to the State Board of Agriculture, with other statistics of the county of Montgomery, for publication by the said State Board, as provided for by law, hoping it may prove beneficial to all concerned, and feel interested in the prosperity of the State:

The geographical position of Montgomery county is what might be termed in the southeastern part of North Missouri. Its south border is washed by the Missouri river, a distance of twelve miles, and is bounded on the east by the counties of Warren and Lincoln, on the north by the counties of

Pike and Audrain, and on the west by the county of Callaway, which places it in one of the most respectable portions of the State, and is subject to be envied on account of its location.

About one-fourth of the surface of the county is undulating, particularly in the south part. The north portion and centre of the county is principally prairie land (no swamp lands). It embraces a variety of soils, and has a soil adapted for almost every kind of product of the State. The prairie land is all susceptible of cultivation. The timbered land likewise, for the most part, is susceptible of cultivation, a great part of which is adapted to the growth of the grape, which is attracting much attention, and being cultivated successfully.

The principal timber is White, Black, Burr, Pin and Spanish Oak, White and Red Elm, Black and White Walnut, different kinds of Hickory, Hard and Soft Maple (the Hard Maple is termed by some the sugar tree), Linn, White and Blue Ash, Hackberry, Honey Locust, all kinds of smaller timbers, such as Sassafras, Dogwood, Redbud, Haw of all kinds, Pawpaw, etc.

The water courses of most importance are Loutre Creek (running through the county from the northwest corner to the southeast corner, west and south of the middle portion of the county), Clear Fork of Loutre, Frairie Fork of Loutre, and the Dry Fork of Loutre, North and South Bear Creek, Wolf Creek, Elkhorn, Coon Creek and Cuiver river, the last of which runs through the north portion of the county. The most of these streams are available for water power a portion of the year.

Springs are not very numerous; the water is what is called hard water in most of them. There is no cause why the people of this county should not have plenty of water at all times that is required, if precautionary means and steps are taken and carried into effect. From the experience of the old settlers of this county it has been demonstrated to be a fact that the earth of its clay nature underneath of what is called the soil, will hold water equal to a basin. For farm purposes, and what is called using water, or water for family use, cisterns or wells dug in the ground supply all domestic wants for water; and ponds supply the demands for stock water. No water surpasses our cistern water in purity and taste.

The subsoil is clay, which is of a nature to hold water, which renders it, as before stated, but a small matter to have an abundance of water for all purposes, even for supplying steam mills, which proves to be much better than natural water power.

The county abounds in wild fruits of all varieties, of which the following comprise a portion: Pawpaws, persimmons, grapes, blackberries of all varieties, raspberries, gooseberries, service berries, whortle (or huckle) berries, strawberries, crab apples, and almost all variety of haws, hickory nuts, walnuts, hazelnuts, and acorns in abundance. It frequently occurs that the farmers in the woodland country do not have to feed their hogs any for pork-making; they get fat enough for any purpose by eating nuts and acorns.

There are no government lands in the county—all taken up some time since. A great quantity of the lands are owned by non-residents, which is not of much benefit to the county. The average price for improved lands is from $12 50 to $40 per acre; unimproved lands, from $3 00 to $30 00, according to location and quality.

The prairie lands are considered to be the most valuable, except the lands known and termed as the Missouri river bottom lands, which are worth from $30 to $100 per acre, according to quantity and improvements thereon.

The mineral resources of this county are far superior to many counties which boast of their mineral wealth. The principal minerals are iron ore, sulphur, saltpetre, salt, stone coal, and all kinds of rock for building purposes—the best of fireproof and frostproof rock. The stone coal is said to be of the best quality, and is being made a matter of trade and exportation. The greatest quantity of coal is found in the northwest part of the county, in the vicinity of Wellsville, and is said to be inexhaustible. New discoveries are being constantly made in different parts of the county.

Experienced persons in the coal oil business have become satisfied that we have coal oil in the county, and are making preparations to test the matter. A company of persons engaged in such business have selected the place to test the matter, at the old L'Outrelick stand, about 2½ miles west of Danville, where there is a salt spring, the water being tinctured with a sulphurous taste. There are natural indications of oil there, and if found in sufficient quantities, will be of incalculable benefit to the county.

The Montgomery county Agricultural and Mechanical Society has been and is still being productive of much benefit by encouraging farmers and all other classes of citizens, of which is embodied herein a report made by the directors of said society for the year 1867, ending the 3d Saturday of March, 1868, which was submitted to the said society at its annual meeting, which was received and approved as being correct. A history of the organization of said society I herewith give, as follows, to wit:

The society was incorporated by an act of the General Assembly of the State of Missouri, approved Oct. 29th, 1857. The society was regularly organized under and in conformity with the provisions of said act of incorporation in the year 1858, and was in successful operation until the beginning of the late war, when it ceased to exist practically. The improvements on and connected with the fair grounds were almost demolished, rendering everything appertaining thereto useless during the war. The improvements were on leased lands, and located one-half mile east of Danville, the county seat. After the hostilities of the war had ceased, the said society was called together by the president of the last directory, who still held his office by the authority of the incorporating act. Upon the call being made, the said society was reorganized and went into effect practically, and at a regular meeting of the members of the society, held on the 28th day of July, 1866, the following amendments to the constitution was adopted, as follows, to wit: In section 1 of article 12 of the constitution erase the word Danville where it occurs, and insert in lieu thereof Danville, Montgomery City or New Florence, as may be hereafter determined. In furtherance of said resolution, at a regular meeting of the society, held on the 1st day of September, 1866, a vote was taken upon the question of the location of the fair, with the following result: For remaining near Danville, 2 votes; for moving to Montgomery City, 3 votes; for moving to New Florence, 63 votes, whereupon the amendment as adopted was declared to read as follows: In section 1 of article 12 of the constitution, erase the word Danville where it occurs and insert in lieu thereof New Florence.

In conformity with the result of the election and the amendment, the directors of the society proceeded to purchase 20 acres of land for fair ground purposes, and to be owned absolutely in fee simple by the society, one-eighth of a mile from this place, and one-fourth of a mile from the North Missouri railroad. The land so purchased cost the society $40 per acre. It is a most beautiful location in the prairie, said to be the highest point on the railroad in this county, with a gradual ascent from the centre to all directions.

The names of the officers for the year 1867: Jacob See, President; Thos. J. Powell, Vice-President; Directors, A. C. Stewart, C. G. Blodes, Thomas J. Wiley, E. G. McGinnis, A. D. Pew, Wilson Guornott, Hiram Lewis, Harris Keeney, S. C. Baker, William D. Bush and Joseph M. Stewart; D. F. Knox, Treasurer; G. W. McCarty, Secretary; N. Patten, Assistant Secretary; 1st Marshal, T. J. Powell; 2d do, Capt. S. W. Hammock; 3d do, General D. M. Draper; 4th do, John T. Hunter, Esq.

On the payment of $20 to the society entitles the person so paying to a certificate of membership. The number of stockholders, by certificate, at this time, is 111. The financial condition of the society is such that those who are acquainted with all the circumstances connected thereto are very encouraging to those who are connected with the society, and feel satisfied that the society will succeed well, and finally meet with complete success, and will be of undoubted benefit to the county, and be an additional evidence that such enterprises should be encouraged.

The fair ground is inclosed by an upright plank fence, 8 feet high. The posts are of large size and let in the ground 30 inches. The ring to exhibit stock in is 180 feet in diameter. The amphitheatre is completed of the length of 300 feet in a half circle, well seated and braced, and is covered in with two-foot boards; has a promenade the whole distance, eight feet wide. In its present condition 3,000 persons can be comfortably seated. There are 18 booths, and 40 stalls, the latter, however, are not completed as they should be, but will take but little labor to complete them. The directors' stand and office is in the middle of the amphitheatre, and under the same roof; a neat stand for the music band and awarding committees is in the centre of the ring. There is also a good cistern, a pond, and a ladies' dressing room. The amphitheatre and other buildings are left in such a condition that they can be enlarged at the discretion of the society. There is also a half-mile track inside of the inclosure, encompassing the amphitheatre, made for the purpose of trying the speed of trotting, racking or pacing horses.

When the fair was moved to this place there was an outstanding indebtedness of said society of about $96 00, and nothing in the treasury. The report of the directors, made at their annual meeting, shows the following aggregate statement of the financial condition of the society:

Amount of cash received from all sources	$5,480 25
Amount of cash paid for improvements, tickets, printer's fees, etc	5,819 93
Oustanding indebtedness, to wit—	
Amount of balance owing for the fair grounds	$ 700 00
Borrowed money owing	2,200 00
Outstanding warrants	1,165 68
Total amount of indebtedness	$4,065 68

From the above and foregoing exhibits we find that the society, when commencing at this place, was owing about $90, and nothing in the treasurer's hands, and owned no property; and also find that the society took in last year $1,424 57 more than the present indebtedness, and the probability is, and we have all reasons to believe, that our receipts this year will be fully one-third more, at the least calculation, than that of last year; we will then be able to meet all proper demands, and to enlarge or add to our improvements, which will undoubtedly be demanded by the public.

Number of premiums offered last year	253
Number of premiums contended for and taken	165
Value of premiums offered	$1,700 00
Value of premiums taken	1,488 00
Amount of premiums paid in cash	556 80
" " " plate	931 20

It was left to the persons to whom the premiums were awarded whether it should be paid in cash or plate.

Number of horses entered for exhibition, of all ages and different grades	108
Number of mules of all ages	31
Number of jacks and jennets	9
Number of cattle of all ages and grades	37
Number of sheep of all ages and grades	22

The summer season being dry and unfavorable for vegetable and other products of the farm and orchard, the exhibition of articles under those classes was rather small, but fully up to the expectation of the directors, they being aware of the unfavorable season for such growth. On account of the rains in the early part of the season, there were very good crops of wheat, oats and Timothy hay raised; the corn crop fell short at least two-thirds.

The society labored under many disadvantages. At one time, only about four weeks before the time fixed for the fair, it was thought impossible to have it at all, on account of being disappointed in getting the amphitheatre and other work done according to calculation, and was so reported through this and adjoining counties. The county fair of Pike county was also had at the same time as this—a distance not exceeding thirty miles—which competed with the interest of each by a division of stock and people. It was not intentional; it merely so happened on account of the uncertainty of there being a fair at this place for said year. Notwithstanding all the difficulties it had to encounter, the result of the fair was highly gratifying, commencing on the 17th of September and continuing five days with gratifying success and general satisfaction.

The principal products of the farms of this county, is corn, wheat, oats, rye, timothy hay and tobacco, all of which are cultivated successfully. All kinds of vegetables are raised, and all do well in any ordinary season. The price current is governed principally by St. Louis prices, being but a short distance from St. Louis. The freight expense does not make much change. Stock raising is followed largely for the foreign market, such as horses, mules, cattle and sheep.

The raising of sheep is attracting great attention, and is taking up the whole attention almost of some of our best farmers. Some farmers own as many as four thousand; they are raised both for wool and mutton. The French and Spanish Merino are being introduced largely, some very fine bucks of those breeds; and some have been sold as high as $700.

Where the proper care is taken of sheep, they do well, and has proven to be a very lucrative business. The greatest difficulty encountered here, in regard to sheep raising, is, that they are subject to a humor in the blood, which is called the scab, which causes them to get poor, and to rub and loosen their wool. The remedy applied for this disease is: wash them with tobacco water, which is said to be a cure.

Mixed farming is altogether the rule with us, almost every farmer produces everything that is subject to his wants. He raises his own horses, mules, cattle, sheep, hogs, poultry of all kinds, fruits, grains and vegetables.

We have a multiplicity of towns on the North Missouri Railroad, which runs diagonally through the county, entering the southeast and passing out at the northwest corner. There is, commencing on the east, Jonesburg, High Hill, New Florence, Montgomery City and Wellsville, all flourishing and healthy places, and of considerable note. North of the railroad, there is Middletown, Price's Branch and Stockland. On the south side of the railroad, there is Danville, the county seat, Big Spring, Rhineland, and Bluffton, all business places of considerable note, and an honor to the county.

We have superior educational advantages, outside of the common school system, which is equal to any county in the State. There is the New Florence Academy at this place; with High Schools at High Hill, Jonesburg, Middletown, Montgomery City and Danville, all of which are well patronized, thereby giving great encouragement to the citizens of the county, in the matter of education, which is so essential to the wants and prosperity of any government.

From the foregoing report, I trust you may collect information which will be of advantage to our people.

By order of the President of the Board of Directors, of the Montgomery County Agricultural and Mechanical Society.

MARION.—O. H. P. Lear.

I send the following report for this county, relative to weather and crops, which is mostly taken from my diary, in which I have recorded daily, something of interest, respecting the weather and crops, such as the opening of spring, beginning of plowing, planting, sowing, ripening, harvesting, etc., for the last sixteen years.

January 5, hail; 7, snow, two inches; 11, thermometer at zero; 12, 2° above; 13, snow, eight inches; 14, snow, five inches; 16, 4° below; 17, 10° below; 18, 10° below; 19, 32° above; range to 28, 6° above to 25° above; 28, 6° below; 29, 12° below; 30, 4° below; 31, 4° above, put up ice fourteen inches thick.

February 9, 1° below; 16, snow gone; 26, 20° above, rain and snow.

March 1, 40° above; 12, rained all day; 14, manured the garden and sowed lettuce; 16, 70° above, at 2 P. M., heavy rain and wind from the south; 18, 32° above; 19, peach buds swelling, plowed for oats; 20, began to sow oats; 22, 84° above at 6 P. M., planted onions, lettuce, etc.; 25, rain and mist; 27, 32° above, snow, 4 inches; 29, slight freeze.

April 2, 28° above; 5, 24° above, hard freeze; 6, planted potatoes; 9, 24° above, snow, four inches; 11, snow gone by noon; 14, rain; 17, Eaton cherries in bloom; 19, peach trees in full bloom, planted one acre of potatoes; 22, planted four acres of corn; 25, rain; 28, rained all day.

May 1, started plowing again, land heavy; 5, slight rain; 6, rained all afternoon; 7, rained hard, water standing in the furrows; 14 and 15, planted twenty-five acres of corn; 27, finished planting my crop of corn, white dent variety, it made itself perfectly, Cicade appeared to-day; 28, hard rain.

June 1, rained, set cabbage; 4, rained; 17, cut clover for hay, eight loads; 28, rained, twenty-four days since last rain.

July 3, began harvesting my blue stem wheat, sowed on the 18th of Oct., average sixteen bush., May and New York Preminm from four to eight days earlier; 6, good shower at 6 P. M.; 7, shower at noon and another at night that washed away fences, etc., two miles east the dust was not laid; 18, rained at night; 20, 96° above in the shade; 23, slight rain, very hot up to the first of August.

August 1, sowed turnips; 11, sold yellow harvest apples; 18, rained a fine shower; 28, rained; 31, rained, my seedling peaches are in their prime.

Observations taken at 7 o'clock, A. M., when not otherwise stated.

Sept. 5, rain; 6, rain; 8, rain; fallow is in fine condition to break now; 15, rain; 17, first frost; 19, rained all day, 20, rain; land too wet; 22, began sowing wheat; 28, frost and ice.

Oct. 6, began to gather my winter apples; 25, finished sowing wheat; 29, finished digging potatoes.

Nov. 8 and 9, raining constantly for 36 hours, and 12 inches in depth; 16, rain, 17, snowed 2 inches; slight freeze; 24, rain.

Dec. 4, snowed 9 inches; the ground not frozen; 6, snowed 8 inches; 8, 20° above; 9, 12° below; 10 0; 11, 20° below; 12, 12° above.

Our wheat crop was considerably above an average. This county will average 26 bushels of A. No. 1.

Oats a fair average.

Hay above an average.

Rye and barley are not raised to any extent (not because they will not grow here).

Buckwheat was a failure.

Corn, in the eastern part of the county, is a full average, but our rains were partial, as you will see by examining the first part of this report, and the central portion of our county, from north to south, suffered severely by drouth. Some fields a clean failure, and many more will not make 10 bushels per acre, but many others will make from 50 to 75 bushels.

The hog crop better than last year.

The fruit crop was almost a failure. Peaches were fair. Pears scarce in quantity and quality, the pears also blighted badly. The apple, that world-renowned fruit, was a failure, many large orchards not producing a single bushel; yet some sheltered localities on the highest elevations, have a small portion of a crop, not over one-third. There are many *theories* offered as the cause of the failure (we had a heavy bloom); the most probable cause was the severe drouth of last season; the result was immature fruit buds.

I would like for you to give in the report (I have not a copy by me) Prof. Swallow's report of this county, few persons having seen the report.

PIKE—WM. H. PORTER.

I send herewith a statement of the condition of the Agricultural and Mechanical Society of Pike county.

The society was organized in 1866, and chartered by the county court in June, 1867. We have 150 members or stockholders, who have each paid in the sum of $25. The fund thus raised has been used in purchasing 10 acres of land for a fair ground and improving the same.

In 1867, we received from the county court $150 to award as county court premiums, which was awarded to best stallion, bull and jack—each $50.

In 1868, we improved our grounds by setting out about 200 ornamental shade trees of various kinds, and have a ring 60 yards in diameter (for the exhibition of stock), partly surrounded by seats—can seat comfortably about 3000 persons; a building 50x30, two stories high, the upper story used as directors' room, secretary's office, etc., and the lower story used for the exhibition of articles belonging to the ladies' department; a house 75x30, one story, for the exhibition of coarse fabrics and garden products, etc.; stalls for 100 horses and cattle, and a few pens for sheep and hogs.

Receipts from organization to Oct. 2d, 1868	$11,948 80
Expenses from " "	12,312 28
Amount of indebtedness	$363 48

PROPERTY ON HAND.

10 acres land	$1,000 00
Improvements, valued at	3,000 00
	$4,000 00
Amount of premiums paid in 1868	2,034 50

In regard to number and character of animals exhibited, will say that, although in some rings the number was small, in others the exhibition was very fine. Among them may be mentioned brood mares, of which there were 12 entries, and would compare favorably with any ring in the west.

Of thoroughbred cattle there was a good display. Every fair shows clearly that this class is rapidly gaining the attention of our farmers, and considerable ambition is evidence that each one is striving to have the best.

The display of horses and mares was very fine, and as competition was invited from adjoining counties, it is right to mention that Lincoln and Ralls counties were well represented, and succeeded in carrying off a number of the best premiums.

The mechanical department was represented as well as usual (for a county fair), in the way of saddlery, harness, wagon, carriage and plow work.

I cannot give a statement in regard to "probable quantities of staple products" of the county, as I have no means to ascertain anything satisfactory in this respect.

The census of the county, just completed and published, is as follows, to wit:

Total population	23,271
White	18,906
Colored	4,475
Whites, that read and write	17,715
Colored, " "	609
Head of horses	6,467
" mules	2,331
" jacks	76
" jennets	74
" cattle	8,974
" sheep	31,692
" hogs	26,917
Bushels of wheat	391,660
" corn	1,067,364
" oats	254,540
" rye	1,174
" barley	2,470
Pounds of tobacco	822,360
" wool	96,150
" maple sugar	1,320
Tons of hay	6,460
Gallons of wine	2,300
" molasses	11,200

WASHINGTON—Geo. B. Clark.

I have the honor to transmit, for the consideration of the State Board, the following report of the proceedings of the Washington county Joint Stock Agricultural and Mechanical Association during the past year. An account of the organization of our county association was given in the elaborate report of my predecessor, Fin. R. Hanna, Esq., and which was published in the State Agricultural Report of 1867.

At the time of holding our second annual election it was deemed best by the directorate of the association, in order to secure its perpetuity, as well as system in its operations, to reorganize, by merging the original association into a joint stock company. A corporate company was accordingly formed, having for its basis a capital stock of ten thousand dollars, issuable in four hundred shares, of twenty-five dollars each. The terms upon which these shares were sold were made, in some measure, to suit the convenience of the purchaser; at will, he might pay the entire amount of the subscription, or make payment of forty per cent. installment at the time of issuing the certificate, and execute his note for the sixty per cent. deferred, bearing interest at the rate of four per cent. per annum from date. Paid up stock not assessable until all stock notes should have been converted to cash in the treasury, and all dividends on stock sold upon the last named terms to be applied toward the cancellation of the sixty per cent. notes. Upon these terms the association has sold, up to the present time, about one hundred and seventy shares of its capital stock.

During the year the association purchased a tract of nearly seven acres, within the limits of the town of Potosi—our county seat—with a view to operations. This tract, however, proving ineligible for county fair purposes, the association leased, for the term of five years, an admirable piece of ground of nearly the same size, immediately adjacent to town, and affording the most tempting natural advantages, while the tract purchased will soon be subdivided into town lots, and thrown upon the market for sale. The time necessarily occupied in the reorganization and negotiations incident to a location, passed our second annual fair over to a later date than we deem advisable, under ordinary circumstances, the 27th, 28th and 29th days of October. This date left the association less than two months for the improvement of their grounds. With the most energetic labor on the part of the building committee, this work was accomplished. The grounds, embracing a plateau of nearly three acres, bounded by a considerable stream (Mine au Breton creek), amply supplied with spring water, with a natural amphitheatre of gradual rise, well shaded, and leading to a second plateau on which is located the principal hall; have been enclosed by a substantial plank fence, eight feet in height. The principal building on the grounds, designed for the display of art works, textile fabrics, minerals, and farm, garden and vineyard products, is seventy-five feet in length by thirty in width.

The fair, held on the days above mentioned, proved in the fullest sense of the word a SUCCESS. The weather and all other conditions were unexceptionable and rarely, in the history of the county, has there been so large an assemblage as on this occasion. The premiums opened to competition aggregated more than double the amount offered at the first annual fair in 1867. In the stock departments especially, the amount of premiums was increased greatly above this ratio, and the results fully justified the outlay. The stock departments most deficient in representation were blooded and thoroughbred cattle and hogs. The display of horses, mules, sheep and common cattle was highly creditable to our stock raising community. The cereals were well worthy of especial mention. The mechanical department surpassed anything which had been anticipated for it, both in variety and skill. To the untiring zeal of the ladies, the board of directors are under increased obligations, for the taste and industry with which the textile fabric and art hall is arranged each year. The ratio of increase in value of material displayed in those departments this year, probably surpassed that of the stock rings; certainly so, if we except horses of all work and mules.

As inferrable from the report of my predecessor, those of the material resources of our county most fully developed are its lumber and mineral interests, the first named of which has been a very considerable source of revenue to our people for several years. Within a small area around Potosi no less than thirteen mills ship their lumber from this depot alone. These thirteen furnish employment to little, if any, less than four hundred hands. Beside these there are seven mills in other sections of the county, the manufactures of which are shipped from other depots. The running expenses of these mills will probably average nearly one hundred dollars each per day. The shipments of lumber from Potosi depot for the year commencing December 1, 1867, and ending with the corresponding date of this year (as reported from the railroad office, weekly, to the county paper), aggregates one thousand four hundred and ninety-eight car loads, or nine million seven hundred and thirty-seven thousand feet.

The principal article of mineral exported from the county is lead, the mining and manufacture of which is carried on at various points in the county, and is an important item in our revenue. This article of export has also several railroad outlets from the county, varying in extent with the locality. The shipments of lead from Potosi railroad station alone, during the year ending December 1st, aggregate thirteen thousand six hundred and forty-three pigs, or one million eleven thousand two hundred and twenty pounds. The manufactures from the furnace of Mr. Wm. Long, at Old Mines, (six miles distant), shipped from Cadet depot, for the same length of time, foot up nearly seven hundred and twenty-seven thousand pounds, and the products of the St. Louis Lead Company's furnace, at Kingston (about ten miles distant), are sufficient to bring this export up to immense figures, without the aid of the lesser furnaces in the county. The yield of the Missouri and Pennsylvania Lead Company's Works, at Harmony, (some eighteen miles distant), adds no inconsiderable amount to the aggregate, although I am not in possession of their statistics for the year. The extensive furnaces of Messrs. Long & Co., and Desloge, at Potosi, are included in the above statistics. Of these material branches of our industry I regret the inability to place at your disposal complete statistics of the county.

The seemingly exhaustless zinc mines of our county have been developed during the past year, to a greater extent than ever before, by the energy of Mr. Geo. F. Hesselmeyer, of St. Louis. A furnace has been built and put in successful operation at this place, and which will probably prove but the harbinger of several larger ones, to be erected at Carondelet during the ensuing year.

The adaptability of our soil and climate to the culture of the grape, has probably received more marked attention during the past year than ever before, and vineyards are springing up among our hills proportionately. The first planted of these is that of Capt. F. Will, located two miles from Hopewell, and comprising some six acres. Beside this there are some seven others in its immediate neighborhood, of lesser dimensions. The Norton's Virginia seedling and Concord are found to be the most profitable to our wine growers. Mr. Bowen (of the Vineland Jefferson county nursery and vineyard) states as his opinion that the range of hills around Potosi offer inducements for grape culture second to none in the State. In fact, at the first annual fair held in Jefferson county, several samples of Washington county wines were awarded first premiums. Our fair having transpired at so late a season, it was impossible to collate any facts of importance with regard to the progressive growth of other fruits in the county.

SCOTLAND.

The population of our county is about ten thousand.

A great many people have an idea, that in a county like ours, in which there are thousands of acres of unimproved lands that the people are all to be found in one part of the county, while the other part is not suitable for homes. This is all a mistake. Our county is divided into seven townships and they all, outside of Jefferson, in which the town of Memphis is situated, have about the same population.

The unimproved land in this county is surrounded by farms, upon which enterprising farmers raise large crops of corn, wheat, oats, etc.

In selecting unimproved lands for a future farm, the settler need not think that he will be cut off from all society and association with his fellow men, but frequently he can purchase a farm, and by fencing one or two sides, enclose the whole of it.

Unimproved land can be bought for from five to eight dollars an acre. These lands can be fenced with an additional expense of about three dollars per acre. By so doing a farm can be procured at from eight to eleven dollars per acre ready for the plow.

By breaking the prairies in the fall or winter, a good crop of corn or spring wheat or oats can be raised the following season.

The advantage of purchasing unimproved lands is found in securing a soil fresh and productive. You can select your own location for a house and out-houses, besides getting it for less money than you could an improved farm. Some of the best land in this county is yet unimproved, and those who toil and work in the East, on a small farm to secure a scanty living for themselves and families, could come here with a small amount of money, purchase one hundred or one hundred and sixty acres of land, and raise corn and wheat enough on it the first year, to pay for the farm, or to add to it one hundred acres more. Daily almost, can be seen covered wagons in our town, with the family of some man from Michigan, or Ohio, or Indiana, who has learned of our splendid county and cheap lands, and has determined to cast his lot among us; but we have room for thousands more. We desire to see every foot of Scotland county placed under cultivation, because we know it will increase the wealth of the county, and because we know there are numbers of men in the East who have been working for years and have not added one acre of land to their possessions, and have but little to leave for their children when they are gone. Such men could come to this county and with the same amount of labor which they perform there to secure a living could here provide comfortable homes for all their children.

The reason they do not come is because they do not know of the superior advantages which our western country possesses in the price of lands. We do not claim that our soil is more fertile than some parts of the Eastern States, because they have as rich soil as can be found on this green earth, but we do claim that you can sell one acre there and come out here to this county and buy with that money from ten to fifteen acres of just as good land.

IMMIGRATION.

It is estimated that Missouri has gained 550,000 in population since the war.

It is also estimated that the emigrant wagons between Columbus, Ohio, and Kansas City, Missouri, would reach a hundred miles, if placed in a single line.

From those estimates we can form some idea of the vast amount of emigration from the Eastern States, and it is yearly growing larger, for as some men locate in our State and learn the low price of lands, and the superior advantages offered to men of small capital, they send the word back to their friends left behind, and soon there is a sale, and another white covered wagon added to the emigrant train.

The important question for us, however, is, does Scotland county secure a fair proportion of this incoming population? If she does we are content. If she does not we want to ascertain the reason why and try to remove it.

From our limited knowledge on this subject we are inclined to the belief that by a proper exertion on the part of our citizens we could increase our population much faster. We at one time were in favor of a county immigration society, but the great trouble with these organizations is, the citizens of the county depend upon these societies to do the work, and many persons who could be influenced to come by the solicitation of friends are not reached at all.

We believe that more can be accomplished by each citizen making an especial effort to make known to friends everywhere the character of our soil and the cheapness of our lands. The inducement to labor for this purpose is the increase of the counties wealth, and with it, the increase of individual wealth and the decrease in our taxes; for increase in wealth necessarily decreases our individual taxes, and if we secure energetic and industrious men to settle among us, we better our own condition in every respect.

Now is the time when we can accomplish most. Many persons throughout the other States in this Union anticipated trouble in Missouri on election day, and this old prevalent feeling, that Missouri was not a very safe place to live, still existed to some extent.

Our election having passed off quietly without any disturbance in this locality, and without any more disturbance in the State than occurred in any other State, refutes this unjust prejudice, and will convince good citizens everywhere that we are a law abiding people, working as a body to place our glorious State foremost in wealth, prosperity and good order, Missouri is bound to be one of the foremost States in the Union.

Her position, her agricultural and mineral wealth bespeak for her this glorious future, and we believe that at no distant day the capital of the United States will be located within her borders.

Let us then, as citizens of Scotland county, "be up and doing," and secure our full share of this rich harvest of immigration. Let us not be behind our sister counties, but let us keep pace with the music of prosperity.

[The foregoing was clipped from the *Reveille*, published at Memphis, Scotland county, date November 26th, 1868. We suggest to the citizens of that county that it would have been to their advantage to have furnished the State Board of Agriculture with a description of the character and natural resources of the county, as well as an account, yearly, of the agricultural condition and progress of the county. Such reports have been solicited from some one in the county every year since the Board of Agriculture was organized, except the past year, when it was presumed that the matter was well enough understood that those who were alive to their interests would act accordingly. Our reports go into very many eastern libraries, and are looked to for such information.—*Secretary*.]

WEBSTER—W. J. BODENHAMER.

I have the honor to report that the "Webster County Agricultural and Mechanical Society," organized on the 21st day of March, 1868, at Marshfield, with the following constitution:

ARTICLE 1. This association shall be styled the "Webster County Agricultural and Mechanical Society"; its objects shall be the improvement of agriculture, horticulture, mechanic arts, rural and domestic economy.

ART. 2. The officers of this society shall consist of a President, Vice-President, Secretary, Treasurer and nine Directors.

The President shall be chosen from among the Directors, and no person not a member of this society shall hold any office in it. The Directors shall be chosen, so far as practicable, from different townships in the county, and a majority of their number shall constitute a quorum for the transaction of business.

ART. 3. The regular annual meeting of this society shall be held at the time of the annual fair, which shall be fixed by the Board of Directors, and shall take place during the months of September or October, in each year, at which time the officers shall be chosen by ballot, and shall serve one year, and until their successors are elected and qualified; provided, that if no fair be held, the election shall be held on the first Monday in October.

Any vacancy which may occur, in any of the offices, may be filled by the board until the next annual meeting.

ART. 4. Officers elected at an annual meeting, shall not assume their duties till the first day of January, following, and it shall be incumbent upon the retiring board to settle up the business of their year, and they shall have till the time specified to perform that duty.

ART. 5. The President, Vice-President and Secretary, shall constitute an Executive Committee, and shall have power to do all acts necessary for the prosperity of the society in the intervals of the meetings of the board, and the Vice-President and Secretary shall be *ex-officio* members of the board.

ART. 6. The duties of President and Vice-President shall be such as usually attach to such officers.

ART. 7. It shall be the duty of the Secretary to keep carefully the records of the society, and all papers relating thereto; to respond to all letters and circulars from the State Board; to make, annually, before the first of December, in each year, a report to the Corresponding Secretary of said State Board; which report shall embrace such items of information, concerning the county society, and such statistics and other facts as are required by law, and as may be desired by the State Board, and to perform all other duties under the direction of the Executive Committee, that may be necessary for the welfare of the society, for which services he shall receive, annually, such compensation as the board may allow.

For failure to make this the annual report of the society, as required by law and this article, he shall pay a fine for the use of the society, of one hundred dollars, which may be collected by law as any other debt may be collected.

ART. 8. It shall be the duty of the Treasurer to receive all moneys due the society, and to pay them out on the order of the President, countersigned by the Secretary, and he shall give bond in such sum as the board may require, for the faithful performance of his duty.

ART. 9. This society shall hold an annual fair at such time and place as may be designated by the Board of Directors.

ART. 10. The President shall have power to call a meeting of the board whenever he may deem it important to do so, and the board may call a meeting of the society, upon due notice being given.

ART. 11. Any person may become a member of this society, by signing this constitution. The privileges of this membership shall continue as long as the provisions of these articles are complied with, or until the name be stricken from the roll by a vote of the Directors.

ART. 12. At each annual meeting the vote shall be taken, as to what amount the members shall pay, not exceeding five dollars, for the next year; and any member failing or refusing to pay the amount thus agreed upon, shall forfeit all the privileges of membership until said amount be paid. The dues of delinquents may be collected by law as other debts may be collected.

ART. 13. The Board of Directors shall annually, after 1868, prior to the first of March, establish a list of premiums to be awarded at the next fair, determine the time and place of holding it, and agree upon rules for its government; all of which shall be arranged and published.

ART. 14. Competitors for premiums must be members of this society, or pay such fee for the privilege of exhibiting as the society may prescribe; and articles offered for premiums must be owned by the person offering them, or by members of their families.

In the department of mechanics, the exhibitor must be the maker, inventor or improver.

ART. 15. No premiums shall be paid on the field crops till the producer shall have furnished a full and explicit account of the variety and method of cultivation, which statement may be published.

The premiums on these crops shall be awarded by the Executive Committee before they retire from office.

ART. 17. The board shall have power to enact any by-laws and rules which may be deemed necessary for the good of this society; provided, they do not conflict with the provisions of this constitution and the laws of the State, relating to agricultural societies.

ART. 18. This constitution may be altered or amended by a vote of two-thirds majority of all the members present voting, at any regular meeting.

ART. 19. Any person signing this constitution, and paying to the Treasurer $10, shall be entitled to all the privileges of an annual member of this society for life.

E. W. Barns was elected President, J. B. Jones, Vice-President, W. J. Bodenhamer, Secretary, and E. W. Young, Treasurer.

The society leased for seven years, and have enclosed ten acres of land near Marshfield, on which it held its first annual fair on the 15th, 16th and 17th days of October.

The previous want of interest on the part of the farmers, added to the political excitement of the Presidential campaign, rendered hopeless an effort to make the fair interesting and beneficial.

The two first days of the fair were cold and raining, very few entries were made, and all visitors were kept away. The third day was more favorable, but cold and disagreeable, and but few people attended the fair.

The only beneficial effect the fair can have had, was to inspire some to greater exertions and cause others to give a less tacit support.

The county is rapidly filling with immigration, and a spirit of thrift and enterprise is growing among our farmers, and with it a recognition of the importance of sustaining an agricultural society.

With a favorable season next year, the prospects are favorable for the success of the society.

SOUTHERN MISSOURI.

ITS AGRICULTURAL RESOURCES AND ADAPTATION TO FRUIT GROWING AND VINES.

From lack of railroad transportation, one of the richest, most healthful and productive portions of the Mississippi Valley has remained partly unsettled. This attractive and fertile region is Southern Missouri. With a mild and salubrious climate in winter, it is blessed with as pure and healthy an atmosphere as can be found in America. South of the 38th parallel of latitude, or beginning about fifty miles south of the Missouri river, is one of the most interesting countries in our Republic. It extends down to the Arkansas line, covering an area of twenty-five thousand square miles.

This section of the State, for the sake of convenience, may be called Southern Missouri; and is wonderfully variegated with valleys and hills. The valleys lie along the streams, both small streams and large ones, and are from three hundred yards wide to two miles in width. Other valleys of level and gently rolling land exist throughout this entire region, not particularly connected with creeks or rivers. They are sometimes nearly circular in shape, containing from one hundred acres to two thousand acres, and are nearly surrounded by hills of from five hundred feet high to fifteen hundred feet high. These slopes, or more frequently hills, are sometimes admirably adapted to the growth of peach trees, grapevines, and the production of blue grass.

These valleys are sometimes long in shape, and will continue for five or six miles, and terminate abruptly by small slopes of steep hills.

The valleys of every kind cover full one-fourth part of South Missouri. They have a deep rich soil, with red clay, yellow clay, and, in a few cases, gravelly subsoil. The soil is easily cultivated, has a proper admixture of lime, potash and phosphates in its composition, and is as fertile as any land in Missouri, Illinois, or the bottom lands of Indiana or Ohio. Every one of these savannahs or valleys in Southern Missouri will yield the largest crops of corn, potatoes, tobacco, hemp, wheat and sorghum. They are more productive than either the upland prairies of North Missouri or Illinois, and will stand drouth better than North Missouri. In these beautiful parks or bottoms there are the choicest locations for building dwelling houses, outhouses and barns. The land seldom needs underdraining, but if it is ever necessary, the slope outlet, the soil and subsoil are remarkably adapted to drainage. In these valleys are to be found the best winter pastures for stock of all sorts, particularly calves, yearlings, cows, sheep and mules, of any place between the Atlantic and Rocky Mountains. The winters are mild and generally free from snow, and the small surrounding hills break off the north winds which so injure stock in Iowa and North Missouri.

Live stock of any kind can be wintered for one-fourth the expense and trouble that they can in North Missouri and Central Illinois. Running water may be found which never fails, and can be easily appropriated to house or farm use in nearly every one of these parks or valleys. As large and as fine vegetables and esculents as were ever produced in America can be grown throughout the length and breadth of this entire region. Cabbages, turnips, potatoes, both sweet and Irish grow to perfection; as do also onions, beets and parsnips. Watermelons, muskmelons and pumpkins grow very large, and of a sweeter or more delicious taste than in any other locality of the same latitude. The rolling lands, and also the hill lands of this region will be spoken of hereafter.—*Missouri Republican.*

PROCEEDINGS

OF THE MISSOURI STATE HORTICULTURAL SOCIETY,

AT ITS TENTH ANNUAL MEETING, HELD AT COLUMBIA,

NOVEMBER 24TH, 25TH AND 26TH, 1868.

PROCEEDINGS.

OFFICERS FOR 1868.

Rev. Charles Peabody, St. Louis, President.
J. M. Jordan, St. Louis, Vice President, 1st District.
Tom Walker, Hillsboro, " 2d "
Alva Culver, Ste. Genevieve, " 3d "
F. F. Fine, Springfield " 4th "
J. L. Minor, Jefferson City, " 5th "
E. Burden, Lexington, " 6th "
H. M. Vories, St. Joseph, " 7th "
J. N. Peyton, Hannibal, " 8th "
William Stark, Louisiana, " 9th "
R. S. Elliott, Kirkwood, Corresponding Secretary.
Wm. Muir, Fox Creek, Recording Secretary.
John H. Tice, St. Louis, Treasurer.

LIST OF MEMBERS FOR 1868.

E. M. Avery, Webster Groves.
C. H. Allen, Alton, Illinois.
T. R. Allen, Allenton, Missouri.
D. C. Benton, Quincy, Illinois.
Richard Barron, Dundee, Missouri.
J. M. Beecher, " "
W. F. Bowen, Vineland, "
H. C. Brayton, St. Louis, "
D. W. Bryant, Pevely, "
Dr. R. Bircher, St. Louis, "
J. H. Bayles, Carondelet, "
S. M. Bayles, " "
F. W. Braches, Gray's Summit, Missouri.
L. Buschman, St. Louis, "
J. W. Benson, Victoria, "
H. S. Christian, " "
Charles Cannon, Webster Groves, "
Dr. H. Claggett, St. Louis, "
Isaac Cook, " "
Clark Chatten, Quincy, Illinois.
J. F. Coleman, St. Louis, Missouri.
Dr. W. S. Dyer, Vineland, "
Robert Douglass, Waukegan, Illinois.
J. W. Drury, Waterloo, "
Geo. M. Dewey, Keytesville, Missouri.
Geo. S. Ditch, Waterloo, Illinois.
John Elliott, Sullivan, Missouri.
Dr. B. F. Edwards, Kirkwood, Missouri.
Walker Evans, Moselle, "

R. S. Elliott, Kirkwood, "
F. F. Fine, Springfield, "
W. C. Flagg, Moro, Illinois.
H. I. Finley, Louisiana, Missouri.
Col. W. P. Fenn, St. Louis, "
S. W. Forder, Carondelet, "
D. B. Gilliam, Alton, Illinois.
H. H. Gibson, Bethalto, "
T. W. Guy, Sulphur Springs, Missouri.
Nicholas Grein, Gasconade Ferry, "
V. Gerber, St. Louis, "
O. A. A. Gardner, Columbia, "
J. F. Gilmore, Elleardsville, "
D. R. Henderson, Dent C. H., "
Dr. John Hartner, Carrollton, Illinois.
Geo. Husmann, Hermann, Missouri.
H. J. Hyde, Godfrey, Illinois.
John Henwood, St. Louis, Missouri.
Henry Henze, Hermann, "
D. L. Hall, Alton, Illinois.
J. H. Hovey, Chicago, Illinois.
O. Henckler, Waterloo, "
A. A. Hilliard, Brighton, "
W. S. Jewett, Pevely, Missouri.
J. M. Jordan, St. Louis, "
Adolph Kehr, " "
Wm. Koenig, " "
J. J. Kelly, Rock Hill, "
S. L. Keith, Palatine, Illinois.
C. Lyon, Vineland, Missouri.
Dr. B. F. Long, Alton, Illinois.
H. T. Mudd, life member, Kirkwood, Missouri.
Henry Michel, St. Louis, "
S. D. Morgan, Central P. O., "
C. T. Malinckrodt, St. Charles, "
Wm. Muir, Fox Creek, "
J. F. Nichols, Chicago, Illinois.
A. Potter, Victoria, Missouri.
J. S. Peyton, Hannibal, "
Stephen Partridge, St. Louis, Missouri.
Charles Peabody, " "
J. M. Pearson, Alton, Illinois.
C. Paffrath, Melrose, Missouri.
J. Rommell, Hermann, "
G. R. Rathbun, Vineland, "
E. A. Reihl, Alton, Illinois.
C. W. Spalding, St. Louis, Missouri.
W. E. Smith, Alton, Illinois.
Carew Sanders, St. Louis, Missouri.
Wm. F. Stacey, " "
William Stark, Louisiana, "
Dr. W. T. Stewart, " "
J. Stadley, " "
E. E. Steines, Oakland, "
Elon G. Smith, St. Louis, "
J. J. Schmidt, Hermann, "
E. Y. Teas, Richmond, Indiana.
John H. Tice, Cheltenham, Missouri.
H. M. Vories, St. Joseph, "
B. F. Veatch, Keytesville, "

L. D. Votaw, Eureka, "
William Weinrich, Carondelet, "
J. F. Walther, Baden, "
G. Wilgus, Richview, Illinois.
C. C. Whittlesey, St. Louis, Missouri.
Tom Walker, Hillsboro, "
George M. Wood, Decatur, Illinois.

In consequence of a severe storm and detention of the trains on the North Missouri Railroad, the Society was unable to convene according to appointment, on the evening of the 24th, but assembled at 9 o'clock A. M., November 25th, in the Chapel of the State University. The blessing of Almighty God was invoked by Rev. Charles Peabody, President of the Society. The President, Professors, and Students of the University were present, as well as the pupils of the State Normal School, and many ladies and gentlemen of Columbia.

Daniel Read, L. L. D., President of the University, in behalf of the Curators and Faculty, welcomed the Society in a neat and eloquent speech to the Halls, Library, Cabinets, Lecture Rooms, and Grounds of the Institution. He called attention to the appropriateness of such an assembling in such a place, and with such noble objects in view, and expressed the hope that ere long Horticulture would form a part of the course of study in the University.

Dr. Read, also, in the place of Hon. James S. Rollins, who had been expected to make the welcoming address, but was detained at his home by sickness, addressed warm words of welcome to the Society in behalf of the citizens of Columbia, saying that their houses were open and their warmest hospitalities were tendered to the members of the Missouri State Horticultural Society and all friends of horticulture who were present.

In response to these words of welcome, President Peabody spoke as follows:

Mr. President. We have heard by the hearing of the ears that you were the right man in the right place. We now see this fact with our eyes and feel it in our hearts. Allow me, sir, in behalf of the Society I represent, to thank you for your words of welcome to these halls of learning, and to the Library, Cabinets, and Lecture Rooms of this venerable University. Excuse my use, if you please, of that moss covered word. And yet, three decades of years, which I believe is about the age of your Institution, on the west side of the Mississippi, in the midst of the swift currents of Young American blood, amount to about as much in real age, as three centuries of time on the other side of the ocean. We congratulate you, and the University over which you preside, in the position which you occupy, and the confidence which you are inspiring in the minds of the people of our noble State.

We also thank you for those words of welcome to the homes and hospitalities of the good people of Columbia, which you have spoken in the place of our honorable friend who is detained by sickness. We had heard before of the hospitality and generous spirit of this people, and your words more than confirm the truth of what we have heard. We had been told that God had made Boone county as the garden of the State, and we rejoice to see that to what God has done, the adornments of art and wealth have been added. We desire to express before hand, our thanks for the generous hospitalities which you have tendered us. It is our earnest hope that we shall not abuse the proffered kindness, but that our coming here on such an errand, may stimulate the people of Columbia, to new zeal in the work of carrying out, in the adornments of their city and their homes, the beautiful plans which the God of nature has begun.

After these preliminary addresses were concluded, President Peabody proceeded to deliver the following

ANNUAL ADDRESS.

Gentlemen of the Missouri State Horticultural Society:

Precedent requires that, as your presiding officer, I should at or near the beginning of this, our tenth annual meeting, present before you an address. I confess to some embarrassment in the discharge of this duty. This arises partly from the fact that I must address, on a horticultural theme, those who have had a larger experience in this beautiful calling than myself, and partly because you have brought me here to face, not the cannon's mouth, but a more terrific battery. You have brought me into contact with learned professors, and sharp minded students and bright eyes which always set our hearts in a flutter. And yet, reassured by the words of welcome we have heard, I beg briefly to call your attention to a theme which I will name

THE HIGHER WALKS OF HORTICULTURE.

The pursuit in which you are engaged, gentlemen, covers a considerable space, both in the affections and labors of mankind. The love of the beautiful in nature is universal. Flowers have their admirers in all climes; gardens have flourished in all ages; their products and adornments speak the language of love, and give vitality to the tenderest sensibilities of the heart. Proud Nebuchadnezzar builds the magnificent hanging gardens of Babylon, one of the seven wonders of the ancient world, to gratify his Medean bride. The modern lover spends an equal proportion of his scanty revenue to buy a bouquet for the girl he loves best. Princes vie with each other in the production of rare and beautiful plants, and, moved by the same impulse, the poor cottager's wife places her thrifty geranium in a broken tea-pot in her cabin window. Lawns and walks, evergreens and shade trees, parterres of flowers and playing fountains, all have charms for the ignorant masses as well as for the cultivated and refined. So it is with the fruits of horticulture. A luscious peach, or a buttery pear, or a delicious cluster from the vine, is relished and appreciated by the poor and rich alike.

Let me then congratulate you, gentlemen, that the errand which has brought you here, or the theme which commands your thoughts and labors, finds such a ready, and, as it were, instructive response from every human heart.

HORTICULTURE DEFINED.

But before we proceed to enter upon the discussion of the higher walks of horticulture, let us consider briefly what horticulture is. As is well known, the term is derived from the two Latin words *hortus*, a garden, and *cultus*, cultivation. Garden cultivation, or the cultivation of those things which grow in the garden, is a fair definition of our theme. I beg you, however, at this point to note two considerations. Our definition does not specify how large the garden must be, nor on the other hand does it declare what kind of plants, or trees, or products, shall be cultivated in it. Nor is there any law or custom which determines either of these points. In the history of horticulture, gardens have been found of all sizes, from a rod square to hundreds of acres. In like manner almost every tree, and shrub, and plant that grows has been introduced into the garden as an object of curiosity or beauty or profit. The inevitable conclusion then is, that if you own one acre, one hundred or five hundred acres of ground and endeavor to make it all a beautiful and productive garden with its lawns and meadows, with its broad avenues and waving grain, with its inviting shades and golden fruits, with shrubbery and plants and flowers in their appropriate places, you are a horticulturist in the best and noblest sense of the term.

DISTINCTION BETWEEN HORTICULTURE AND AGRICULTURE.

But is it here objected that I am extending the realm of horticulture too far, and without leave am taking possession of the domain of a sister pursuit, thus crowding agriculture entirely out of the field? By no means. Horticulture and agriculture are twin sisters, hence it is difficult for us to say which is the oldest or which is the best. From the days of Adam and Eve even until now, they have never quarreled.

Their interests are in fact almost entirely in common. As we look at them they are both comely and beautiful. If the former may seem more attractive, it is mayhap because she puts her wealth and her finery more upon the outside, just like some other damsels we wot of, while the latter, content to wear a plain but comely garb, points with her finger to the lowing herds and the bursting granary, and exclaims, "Behold my dowry." If we are impelled to love the former the best, we are forced to respect and honor the latter.

But, plainly and without a figure, let me add, horticulture and agriculture do cover some ground in common. The analysis and preparation of soils, the influences of heat and moisture, and a thousand other instances of this nature, belong to the two alike. But the domain of agriculture is vastly larger than that of horticulture, although the two do lap over upon each other for a considerable space.. To the former exclusively belong the great staples of the commonwealth the hay crop, the corn, the hemp, the tobacco, and all other products which require only ordinary attention, and are not susceptible of adding any special beauty to the landscape. So also the husbandry of cattle, of sheep, of swine, of horses, of poultry, comprising so large a proportion of the wealth of the community. These belong, without question, to the domain of agriculture. But the department of fruits and of the vineyard, requiring special and skilled labor in their management, and capable also of being made ornamental, as well as useful, belong by common consent to horticulture. And, in a word, horticulture embraces the pursuit of all kinds of culture, which.

either directly or indirectly, will please the eye, or gladden the heart, or add to the rural adornment of our homes.

Having thus briefly, but as I trust clearly and sharply, defined the limits of horticulture, I shall speak of it, first, as a science, and, second, as an art.

HORTICULTURE AS A SCIENCE.

A momentary prejudice is sometimes excited in certain minds, which have been long absorbed in practical pursuits in which they have achieved success, when they are reminded that they may gain some additional advantage by looking into the science of that pursuit. Hence the prejudice quite common against horticultural journals and horticultural books. Book farming and book gardening are often sneered at, and it is to be confessed, sometimes with truth and justice. I honor the man, who, by toil and industry and careful observation, has succeeded, without scientific appliance, in overcoming the difficulties in the horticultural career, and has placed himself upon the platform of assured success. And yet I must remind him that the very science which he may sneer at may have been the true key to all his high achievements. Scientific facts, when once elucidated by genius or toil, and thrown upon the world, travel silently over it, and soon become the property even of him who cannot read a word. The most ordinary processes and issues of human life are thus often conducted to success solely by the light of science, which has been diffused so quietly, and has become so common that men utterly fail to recognize its origin or its power. When, a few weeks ago, you listened with anxious or thrilling hearts to the million voices of the electric telegraph as it flashed from every obscure precinct and over a broad continent the result of the great political struggle, and then heard coming back the responses concerning the nation's verdict from the cities of the old world, from under the sounding sea, who among you stopped to inquire, or cared to know, that an obscure Italian chemist, a hundred years ago, in a dark garret in the city of Bologna, in experimenting upon a frog's leg, discovered and informed the world of this mighty power. So I tell you, gentlemen, that as practical and successful workers in the pursuit of horticulture, you are daily living on and profiting by the light that science has shed upon your path, whether you recognize the fact or not. And I venture to declare further, that your future progress and success in these pursuits will greatly depend upon the progress made in scientific research and the wide diffusion of that knowledge among the people.

NOT ONE OF THE EXACT SCIENCES.

I know there are great difficulties to be overcome in prosecuting scientific research in the realm of horticulture. It is not one of the pure or exact sciences, like mathematics or chemistry or astronomy, where the result is always inevitable, and cannot be otherwise. But it extends over a wide range, and has to do with a multiude facts. Each of these facts is also based upon a multitude of varying circumstances, a slight change in one of which may upset all accurate calculations. The astronomer predicts the coming on of an eclipse a thousand years beforehand, within a second of time. But the horticulturist cannot predict within half a thousand hours beforehand with any certainty the result of his toils. The French mathematician Leverrier, by figuring on the perturbations in the orbit of Uranus, discovers a new planet. Without once looking up to see his new discovery, he proceeds to find the true position of the celestial stranger; he calculates its orbit; he measures its size; he puts it his mathematical scale and weighs it. He now turns round to the astronomer, and says: "Please, sir, point your glass to that exact spot in yonder starry heavens." The astronomer obeys, and behold! there it is; there is Neptune!

The horticulturist also figures over the constituents of his soil—the localities and exposure of his gardens and orchards—the effects of his manures—the influence of heat and moisture—the circulation of the sap—the proper ratio between root and foliage, and especially the price of his peaches, and his cherries, and his pears. The time of the ripening comes. He lifts up his eyes, and behold, then are not there! An unforseen, an untimely frost has blasted them, or the curculio has stung them, or the bugs have destroyed them, or the roguish boys or the birds have eaten them up! The fact is, there were some circumstances affecting and vitiating the result, which did not enter into his calculations.

HORTICULTURE A BEAUTIFUL SCIENCE.

And yet, gentlemen, while horticulture is far from being, like the other sciences named, an *exact science*, it is nevertheless a *beautiful science*. The mastering of all its facts, and the reduction of its processes to a good degree of accuracy, are, I believe, within the grasp of the human intellect. Horticulture is as old as the human race, but, considered as a science, it is new. Botany and vegetable physiology, which may be considered as collateral to it, are more exact sciences, and are well advanced. But the relations between the various plants and the elements of the soil for instance, are yet but dimly comprehended, A vast amount has been written and published on this branch of the subject within the last thirty years, but much of it has only tended to confuse and disgust the inquirer. The fact is, the influence of the great Liebig has tended to establish a certain routine for the examination of the soil and its capabilities from which inquirers have not felt at liberty to deviate. Liebig was a profound chemist and pharmaceutist. But when he turned his attention to that branch of chemistry which had to do with vegetable organisms, he committed the fatal mistake of applying to it the same rigid formulas which he had found to be infallible with oxides and acids and salts and metals. He takes a grape vine, for instance, and submitting to his severe analysis the wood, the bark, the buds and leaves, the fruit, the seeds, he gathers all these constituent elements, together, such and such a per cent of carbon, and of nitrogen, and of oxygen, and of potash and iron of lime, and says: "Take these elements in just this proportion, restore them to the soil, and you have the normal manure of the grape vine. This is the beautiful analytical method of the philosophers, and it is infallible."

THE ANALYTIC METHOD A FAILURE.

But, gentlemen, I think you will agree with me in saying that the experience of horticulturists for the last twenty-five years has failed to demonstrate the infallibility of the analytic method. A tree or plant has life of a certain kind, as truly as an animal, or in fact it is an existence more incomprehensible to us than that of the animal. It feels after and sucks up its nutriment from the air as well as from the earth. It opens its thousand mouths and throws out its million tentacula to catch from the passing breezes elements of nurture too minute or too evanescent to be caught by the clumsy analysis of the chemist. It lays its nimble fingers on the sunbeam as it flies, and in its mysterious spectrum decomposes the light of heaven, sending some parts of the subtle influence to the roots, other parts to the branches, adorning its leaves with the green, and its gorgeous petals with some other of the beautiful hues. The fatal error of the analytic method is that it takes for granted that the elements found in a plant by chemical analysis are derived from the soil alone, and are therefore to be restored to the soil in the same proportion.

It is well known that Liebig has retracted many of those errors, but bating these errors and his false theories it must be admitted that his works on the relations between chemistry and vegetable philosophy, as well as the more full and more practical books of his pupil Prof. Johnston, are invaluable to the horticulturist and the farmer.

THE TRUE METHOD.

But the track of true progress in this branch of horticultural science lies in another and almost opposite direction. If you please we will call it the *synthetic* method. Its programme requires no chemical analysis whatever. It is simply taking the soil, the air, the rain, the dew, the sunshine, as elements in the process, just as God gives them, and then *experimenting* with every fertilizing substance known, upon each and every kind of plant, tree or shrub and noting the results. This method everybody can practice, without any blowpipe or crucible, or acids, or chemical reagents. In fact I take it that most of our knowledge of this branch of the subject has been obtained in precisely this way. For instance, that fact that a heavy crop of clover, plowed in, affords a rich nutriment to the soil was never discovered by analyzing, first the clover itself, and from that analysis drawing the conclusion. But it was no doubt found out, in some happy hour, by experiment.

SIMILAR TO THE SCIENCE OF MEDICINE.

The process proposed is like that of the science of medicine. No chemist or doctor can tell *a priori* by any analysis whatever, what particular effect a certain drug or compound will have upon the human system. He has to *try* first the effect of it (not generally upon himself) and note the result. The beneficial effects of all medicines have been found out in precisely this way. I know this is called sometimes empiricism, and it has been said (but *I* think unjustly) that the doctors kill in this way about as many as they cure. But no one can deny that doctors do succeed better now-a-days in their attempt to arrest disease than in the days of Hippocrates. Hence we must conclude that progress has been made in the science of medicine.

EXPERIMENTS OF PROF. VILLE.

As illustrating and in fact proving the correctness of this method in the pursuit of horticulture as a science, permit me to call your attention briefly to the recent and interesting experiments of Prof. Ville, of Paris, and to their wonderful results. He is still a young man, but having obtained some years ago a position in the *Jardin des Plantes* at Paris, he commenced his experiments. Discarding utterly the analytical theories of Prof. Liebig, he commenced with a flower-pot and pure sand. This was all the apparatus he required. In this flower-pot he plants his seeds. He watches the young plant as it sprouts and grows up out of pure sand. But it soon comes to nought—dies of starvation. He then stirs into the sand a little potash, or nitrogen, or phosphoric acid, or lime, each carefully weighed every time, and again plants his seeds and watches the result. In this way he goes on year after year, manipulating his flower-pots, introducing his fertilizers, and takes note of all the results. The conclusion he reaches is as grand as it is wonderful. He discovers the normal manure of each plant on which he experiments. The Emperor of the French now places at his disposal one of the imperial farms at Vincennes, and he has been, during the past year or two, repeating his experiments on a grander scale. The results are the same as when he worked with his flower-pots and sand. In a word they have astonished both practical and scientific men. I cannot now enter into the details of these important experiments but beg to refer you for more full details to an address before the Massachusetts Board of Agriculture by Hon. E. W. Bull, of Concord, delivered December 10th, 1867, where they are stated with sufficient minuteness.

Here, gentlemen, are proofs, both brilliant and conclusive, that the *synthetic* method is the true pathway to success in horticultural science. It will apply not only to the matter of soils and the proper fertilizer for each plant, but the same principle must guide in all the methods of horticultural pursuit, in order to make them successful. To determine what to plant, how to cultivate, how to prune, how best to secure the fruits of your toil, you must experiment carefully, judiciously, wisely, and note all the results. The practical worker here becomes a laborer in the scientific field. The man who has the leisure and learning, and the means to prosecute extensively these studies, must largely depend upon the facts he obtains from practical men. Hence the importance of such gatherings as these annual meetings. Facts are here communicated which, when collected, form the basis of all our progress.

DISEASES AND BUGS.

But before leaving this branch of our subject permit me to call your attention to two collateral sciences which have a very direct bearing upon horticultural success. I refer to diseases of plants, and destructive insects. In view of the evident and rapid increase of both of these pests, and the fearful havoc made by them upon the whole domain of horticulture, the stoutest heart stands appalled. It has been said by good authority that one half of the agricultural products of the United States are destroyed annually by insects. If, therefore, the total agricultural products of Missouri be estimated at sixty millions of dollars, the total, if let alone by destructive insects, would have amounted to one hundred and twenty millions of dollars! *Sixty millions* is a large tribute for this commonwealth to pay each year to an enemy so insignificant.

But the proportion of loss from this cause in those products which are purely horticultural, must be much larger, from the fact that such products are generally more delicate, and on that account more readily attacked by insects.

There seems but one way to avert the impending catastrophe, and that is for every man who has a tree, or a shrub, or a vine, or a rose bush, to second the labors of scientific men, in investigating these evils. There is no other power which we can evoke; none whatever which can suffice to cast out this terrible devil, but the hand of science. Without here indicating how this is to be done, I will only call your attention to a paper on the diseases of fruits and fruit trees, to be read at this meeting which has been prepared by one of the best microscopists of our country. Also to the fact that we have among us this week those who will communicate important facts concerning our mortal enemies, the insects.

I now pass to the *second* part of the subject, viz:

HORTICULTURE AS AN ART.

There is a pleasure in the pursuit and acquisition of knowledge. It is one of the purest and most satisfactory enjoyments within our reach. The discovery of *abstract truth, i. e.* of truth which has no immediate relation to material objects, is a source of pure pleasure. When the knowledge obtained has a close connection with material things, terminating on something which we can see or handle, the enjoyment is still greater. But when those objects are in themselves pleasing, lying in close contact with our æsthetic nature, and especially if our minds have required a love of the beautiful, the pursuits and acquisition of knowledge is exalted into an enthusiasm.

Horticulture as an art has to do with practical things. Those things are generally objects of beauty, and hence pleasing in themselves. The conclusion is that the art of horticulture is capable of affording its votaries enjoyments of the noblest and most exalted character.

Before proceeding to elucidate this proposition, allow me here to add that art properly defined, refers to some act or process requiring intelligent skill. Hence the proper planting of a tree, or the correct pruning of a vine, or the general management of the garden, all belong to the art of horticulture. It will be seen at once that this covers most of the entire curriculum of its labors.

I shall not dwell upon these details, for I speak in the presence of those who have spent long years in labor, pruning knife in hand, and who will communicate during our meeting the results of their manipulations.

I prefer to direct your thoughts to that branch of horticulture, as an art, which I have no objection to your considering as one of the

FINE ARTS.

The moment the mind settles down to the contemplation of this theme, in connection with the history of this society during the ten years of its existence, there cannot but arise a feeling of regret that that branch of horticulture, properly called pomology, should have occupied the principal, not to say the only share in your deliberations, Apples, peaches, pears, grapes, have trenched somewhat at least upon the lawn, the parterre, the winding walks and the gushing fountains. In the place of roses and verbenas, have sprouted up the gooseberry and the currant. Where a few years ago should have been planted a few more evergreens or elms, arise now a straight but comely row of Janetons or Newtown pippins.

I wish to bring no accusation against the society or any member of it. The neglect of that which is the most beautiful part of horticulture is, no doubt, excusable. We all mean to adorn our homes. We look forward a few years to the time when we shall have the means or the leisure to do it. In fact, the very enthusiasm with which we cultivate strawberries and grapes is stimulated into activity by the prospect of acquiring thereby the means of doing this very thing. Then, again, we are in a new country. The great majority of those who follow horticulture as a pursuit have just commenced. Their slender means are all invested in that which gives promise of the most speedy and most remunerative results. During these ten years of our young life, our beautiful State has been overrun by contending armies. All progress was then arrested. The beauty and the culture which had already begun to adorn the landscape was in many places swept away,

But I congratulate you, gentlemen, that you are now entering upon a new career, which I trust will prove a career of great peace and prosperity. Let me therefore enter an earnest plea that we shall hereafter in our deliberations and discussions give a little more place to horticulture as one of the fine arts.

THE BEAUTIFUL IN HORTICULTURE WILL PAY.

Let it not be said that the cultivation of the landscape, and its adornments will not pay—that tulips and roses and zinnias are well enough for women and children, but there is more money in raspberries and peaches.

I tell you, gentlemen, and I believe it from the bottom of my heart, there is nothing within the whole range of horticulture that will pay better than flowers and evergreens, than lawns and walks and rural beauty, placed just where they will be most appreciated, even under your own eye and around your own dwellings. Their is other coin besides dollars which is current, even in this world. Do all our hopes and aspirations terminate upon the possession of money? Ah, no. There are aims and purposes more grand and noble, and money is only useful as the means of their realization. It is the cultivation of our higher nature for which I plead. It is that we shall not cast aside and trample under foot those delicate, instinctive sensibilities and tastes with which the God of nature has endowed us.

LOVE OF NATURE IN CHILDREN.

I have said that the love of the beautiful in nature is universal. We see it in little children. It is true, as the child becomes a man, and comes into rough contact with the stern issues of human life, those delicate tastes are often obscured, and sometimes well nigh blotted out. But in the little child you will always find them in all their vivacity and beauty. Take your country boy to see, for the first time, the wonders of the town. He surveys the lofty buildings, and the brilliant displays in the shop windows, first with bewilderment, then with amazement, and finally with weariness, and then wants to go home. But bring out now your city boy into the green fields. Let him romp upon the broad lawn. Let him run up and down the winding walks among the flower beds, where his eye catches the inspiration of art and nature. Does he want to go home? Never! And what is more, you feel safe in allowing him to take his fill of such enjoyment, for you are certain that it will neither vitiate his tastes nor corrupt his heart. Nay, more: what you see in that boy—the glow of pure enjoyment which mantles his cheek, the zest with which, under the influence of these surroundings, he pursues his pastimes—illustrates the powerful influence of rural beauty upon the human heart. This influence is ennobling as well as refining. A constant contact with cultivated nature is also an *educating influence.* I say it in this presence, in the midst of these halls of learning, on the spot which has been honored by our noble State as the trusted repository of her hopes for her sons in the future, that no education is complete which ignores or neglects it. Let every school and university have its *academia* as of old. And though no Plato may be found to talk wisdom and knowledge, as he walks beneath its shades, let those walks be adorned on either side by lakes and fountains, by paterres and vistas, so that the place itself shall be vocal with a wisdom sublimer and more profound than that of Athenian philosopher or sage.

Gentlemen, please take home to yourselves the question, whether this society ought not to place itself at the head of a culture so full of promise for both youth and age. It has been said by many careful observers that, in this most attractive branch of horticulture, our State is far behind even some of its younger sisters. If this be so, it certainly cannot be attributed to any defect in either our soil or climate. Nor does it arise entirely from a lack of age or wealth. St. Louis, one of the odest cities in the Mississippi Valley, though possessed of unbounded wealth, has not a garden of any extent worthy of the name, with the exception of Lafayette Park, really but just commenced, and the magnificent and princely paradise of Henry Shaw. So far as I have observed the same state of things exists in the larger towns and cities. There is plainly great need of improvement in the public taste and of stimulation of the public mind in this direction. I make no suggestion as to what this society, in its organized capacity, is able to accomplish.

But I will venture to express the belief that if every member of it would, in his own neighborhood and on his own premises, set the example, by giving a little more time and thought to the principles of landscape gardening and to the cultivation of flowers, all bestowed with judgment and care and taste, the example would be contagious; others would be found to imitate him. Progress in this direction would certainly be the result.

I have expressed the belief that time and money thus spent would be a good investment. My friend, it would be better than food or clothing for your household. The pleasant labors thus inaugurated would prove a means of health and happiness among your children. Make your home thus attractive and those children will love it better than all other places. They will not easily be drawn from such employments, and such surroundings towards the theatre or the horse-race, the circus or the saloon. "They will grow up like fruitful vines by the sides of thy house; like olive-plants round about thy table." In this broad and beautiful culture you will have constantly under your eye an open volume, next in value to that of inspiration itself, on whose glowing page are sketched by God's own finger in living light, truths of the rarest beauty and power. Follow the light of these truths, familiarize your minds with their mysterious teachings. Watch in the tracery of this matchless beauty the movings of the Divine pencil. Catch in the fragrance of the flowers the perfumes scattered from the wings of angels. Study, contemplate, drink in all this. It will serve to fit you for the companionship of seraphs in the paradise above.

After the delivery of the president's address, the recording secretary, Mr. Wm. Muir, presented the following

REPORT.

Mr. President and Members:—Ten years have now elapsed since the organization of this society; and, upon taking a retrospective glance at its labors, and the changes that have taken place in our State during that time, it has seemed that something is wanted to maintain a clear historical connection with the past, showing the relations sustained by our State to the spirit of agricultural and horticultural progress, so that we may know and honor those who have been our fellow-laborers in the days long past.

We daily see the importance of this, from the fact that some individuals speak and write as if all that is known of progress in the culture of the soil dates within the last few years.

The settlement of the State by a white population in any considerable number, may be taken as dating about 1800. At that time a few daring spirits undertook the redemption of the State from the savages and the wild beasts of the wilderness.

At this early date we are pleased to learn that, although adventurers in a strange wilderness, these early pioneers brought with them their old home feelings and desires for home enjoyments. They brought not only the gun and the axe, but the spade, and the seed of the useful plant and the fruitful tree. We find in several parts of the state orchards of fifty to hundreds of trees (principally apples), planted as far back as 1805.

Several such orchards yet present their massive stems and ragged heads in St. Louis and St. Charles counties. These old relics tell a horticultural tale.

The names of the Hamiltons, the Williams, the Musics, the Sappingtons, the Sullivans, the Lacompts, the Conways, the Harris's, and the Browns, still live in the old moss-grown orchards.

It has been well said by a late writer, men "have been observed to migrate very nearly on parallels of latitude. We should very naturally expect to find the law that governs the movements of men applying with equal force to the fruits they carry with them." So we find it; and a key might be found to the early character, habits and associations of the first settlers, in the lessons taught by those old orchards.

We have sometimes felt grieved and disappointed—almost angry—at what we have conceived to be committing an injustice to the memories of these "old men," in comparing the progress made in arts and refinement in this State then, to that made within the last few years. These men met everything new, and wild, and strange. They bring vividly to the mind the beautiful incidents so pathetically related in Sacred Writ—how, when the Jews returned to Jerusalem, they had each to stand on the top of the wall with his sword or spear in the one hand, while he built up the walls of his beloved city with the other. So it was with those early pioneers: the gun rested on the tree to protect themselves from their enemies, while they felled the forest to make room for the seeds of civilization; and if they did not accomplish it as well, or as fast, as some of their self-complaisant criticisers, they made a wide opening in these western wilds.' Perfect uniformity in the rate of progress is not always desirable, even where possible. How would it be with our knowledge of the passing hours, if the hour-hand of our time-piece kept even pace with the second-hand? Infinite variation is the poetry of the landscape.

All honor to the noble band of pioneers who have hewed out this beautiful gateway to the civilization of a continent, redeeming it from the ancient forest, the savage and the brute; ours be the task of giving beauty and consistency to the structure!

From our stand-point in social life, we have been, perhaps, too apt to charge those early settlers with a recklessness and prodigality; with a want of that steady accumulativeness that tells a dollar and cent tale in every transaction.

We seem to fail to appreciate the nature of the labor they had to perform; the privations they had to suffer; the risks they had to run; the powerful traits of character that their circumstances evolved and stamped upon society. We can well conceive that in the fierce struggles of early settlement, the highly sensitive and refined would sink under their trials; while the powerful in body and mind, alone, would hold out. We know that in the thinly-settled condition of the country, without roads or means of communication, they had few inducements, and still less opportunity to dispose of their little surplus, to trade, or to accumulate; and in the social gatherings, the interchange of visits, the sacred duties of hospitality, they took delight. In their homes, in that deep solitude and isolation, they possessed all the highest sympathies of our race. With the smoke of the chimneys (the sighs and remembrances of the inmates of those "dear old homes of their childhood, so many miles away"), they welcomed the foot-fall of the stranger to tell them of friends long left, but never forgotten; of national men and national parties from whom they were now shut out. There the "latch-string" ever hung out, and the strong sympathies of human nature were intensified.

How much of will-power, of noble self-reliance, of genuine hospitality, have impressed their most powerful lineaments on our Western character, it would be interesting and valuable to know.

That these men clearly appreciated the value of the culture of the soil in general, and that the higher branches of horticulture were not quite forgotten, is shown by many of the old homes and old orchards. In 1816, Geo. Stark settled in Pike county, and planted out an orchard and nursery. The influence of that single step is felt down to-day. From a single town in Pike county (Clarksville), there was shipped 40,000 barrels of apples in one season.

As an illustration of the love of fruit in our early settlers, one of them told us that, on leaving his seaboard home in Virginia, to come to the West, he started with his wagon a few hours earlier in the morning, so as to pass the farm of a neighbor who had the fame of good fruit, and took up some of the young trees to plant in his distant home.

We have eaten the fruit in one of the old orchards in St. Louis county, planted in 1805, by the man who introduced the first wagon to Meramec township. So great and so useless was this innovation at that time thought, that the old man Hamilton was thought to be crazed; and, as a practical joke, the youngsters took the wagon to pieces, and hung them up in the trees, he having been obliged to leave it in the woods over night, a short distance from home. But that wagon, by displacing the pack-horse, and causing roads to be opened, was a precursor of our splendid existing road system. Surely the "fairy tales of the one age, are but the scientific realizations of the next."

The State was admitted into the Union in 1821. Intimately mixed up with the alarming difficulties associated with the organization of the State government, but little public attention was given to the culture of the soil. Nor was this to be wondered at in a new State, when we remember that no action was taken in recognition of the importance of agriculture by the general government for nearly thirty years more.

A committee of agriculture was among the standing committees of the State Legislature—but little was done in its behalf.

The necessities of the cultivators of the soil for seeds, trees and implements, caused the broad commercial spirit to move, and, by commencing seed stores and nurseries, awakened the people to some knowledge of what was needed and could be obtained to aid their efforts at tillage.

In 1845, Mr. Griffin, of Grundy, from the committee on agriculture, reported "an act to improve the breed of sheep;" and, during the same session, a letter was read in the House of Representatives from M. M. Marmaduke, of Saline, "suggesting certain enactments in relation to sheep and wool-growing."

In 1846, "an act to encourage agriculture" was introduced into the Legislature, and in the same year the St. Louis Horticultural Society was formed.

In 1848, an act was passed "to incorporate the St. Louis Horticultural Society," and Thomas Allen, Lewis Bissell, Wm. Milburn, Jas. Blake, Wm. Salisbury, Ed. Haren, A. B. Chambers, E. Malinckrodt, F. M. Meline, F. E. Robinson, James Turner, Nicholas Riehl and James Sigerson, were chosen corporators. This society was formed "for the purpose of encouraging horticulture and rural art and improving rural taste." And well did it fill its mission for many years, by monthly meetings, published discussions and semi-annual exhibitions.

During the same session an act was passed that illustrates the spirit of the time, entitled "an act to promote growing wine in Gasconade county." A joint stock company was incorporated, by which Hans D. Widersprecher, John Schaeffer, Julius Leipold, Joseph Lissel, Ed. Cramer, Herman Burkhardt, Anthony Miller, Peter Miller, Claus Martins, Franzi Baing, Chas. D. Eitzen, Christ. Moller and Mathias Keranter, were named directors, whose duty it was "to report the condition of growing the grape in their county; the improvements made within the last year in kinds; raising and management of wines; with the quantity, quality and probably value of the wine they raise, with such other information on the subject of wine raising as they may think useful to the public." Here we have in these two societies (formed twenty years ago) all that we are so proud of in ours to-day—the general diffusion of knowledge, founded on experience.

During this same session, the geological survey of the State was much discussed.

Nor could this expanding public mind continue long without a mouthpiece—so we find that, in 1849, the *Valley Farmer* made its appearance, with Ephraim Abbot as editor, giving force, consistency and unity to the accumulating power.

In 1850, Mr. Alexander Kayser, of St. Louis, offered the very handsome premium of $100 for the best wine made in the State. Twenty-seven samples were presented, and the premium awarded Jacob Rommel, of Hermann, who thus early made his mark as a wine grower. This was a sample from 160 gallons made by him in 1849.

Mr. James Glasgow, Ed. Haren and James Turner, of Louis, and Mr. Suffigier, of Highland, Illinois, this season exhibited samples of wine made at their several places in 1847-'8 and '9.

In 1853, Mr. Maupin, of Saline, introduced a bill into the State legislature, to "incorporate the State Agricultural Society," which was passed, and the following Board of Directors named:

M. M. Marmaduke, Saline, President; Camms Seay, Osage, Vice-President; James L. Minor, Cole, Corresponding Secretary; Jos. L. Stephens, Recording Secretary; John H. Trigg, Cooper, Treasurer.

Directors—James S. Rollins, Boone; Nath. Leonard, Cooper; Dabney C. Garth, Randolph; Rowland Hughes, Howard; James C. Henderson, Callaway.

We here stop to notice a man worthy of the gratitude and esteem of every cultivator of the soil in the State—one who has been the untiring advocate of the agricultural interests of our State; who has devoted more time, more labor, from pure love to this cause, than perhaps any other man in the State, and that extending over a long series of years—we refer to James L. Minor, for some years Secretary of State, and now a resident of Jefferson City.

In 1855, Monroe, Jackson, Clay and Howard counties—all formed agricultural associations. The journal of the House, of this year, contains an able report of the State Society's Fair, with the list of premiums, etc. During this session, the St. Louis Agricultural and Mechanical Association was chartered. The powerful influence and successful management of this Association, have done much to call public attention to the soil, and to call the attention of cultivators to their wants and the supply.

In 1857 the attention of Horticulturists was called to the necessity of forming a State Fruit Growers' Society, by the Hon. N. J. Colman, editor of the "Valley Farmer," which was finally accomplished in 1858, in Jefferson City. At the annual meeting, in 1862, in order to give wider scope to the operations of the Society, the name was changed to the "Missouri State Horticultural Society."

During the ten years of the existence of the Society, it has done much to aid in developing the resources of the soil in various channels; its proceedings have been regularly published and extensively read. Its influence has thrilled through every portion of the State—affecting, alike, the surroundings of the mansion of the millionaire, the residence of the professionalist, the home of the farmer and the cottage of the laborer. It has not only been felt by all classes of society, but it has permeated the halls of legislation—been recognized as worthy the consideration of the State, is aided in its labors by a State Board, and instructed by a State Entomologist, and now awaits the crowning glory of the age—a Grand Agricultural and Industrial University.

In this we see the course of development, and comprehend how the rough edges can be smoothed down, and the tardy steps of the descendants of the early settlers, quickened by the infusion into our population of an admixture of those who entered life amid scenes and associations calculated to refine and enlighten; and how the blending of these elements of power and refinement, hospitality and fugality, will give the "coming cultivators of the soil" that complete balance, which is the perfection of humanity.

All of which is respectfully submitted,

WM. MUIR, Secretary.

TREASURER'S REPORT.

Mr. John H. Tice, of St. Louis, Treasurer of the Society, then rendered his report as follows:

MISSOURI STATE HORTICULTURAL SOCIETY IN ACCOUNT WITH JOHN H. TICE, TREASURER.

Jan. 1, 1868.	To balance on hand	$ 78	43
	To amount received of members	189	00
	To amount H. T. Mudd life member	10	00
		$277	43
	CONTRA, CR.		
Jan. 20, 1868.	By amount paid Wm. Muir, Secretary	$100	00
	By order to H. T. Mudd	81	81
	By order to Woodson for janitor, fires, etc	20	00
	By order to Studley & Co	9	00
	By order for mending chair		62
Nov. 24	By balance on hand	66	00
		$277	43
	To balance brought down	$ 66	00

Dr. Spalding moved that the Treasurer's report be referred to a committee of two.

Adopted.

The President appointed Dr. Spalding and J. M. Jordan said committee.

Dr. Spalding called attention to the amendment to the constitution of the society providing for life and honorary membership.

Dr. Daniel Read, President of the State University, was, on motion, elected honorary member.

PEAR CULTURE.

Mr. E. R. Mason was called on to state his experience in the culture of the pear in St. Louis county.

He said that he was taken by surprise, but being unable to remain any longer than afternoon, would give the results of the experience of eight years culture.

He planted his trees in the winter of 1860. The land was elevated, and protected on the north side by sheds and the rows of the orchard. The ground was deeply cultivated and underdrained before planting, but have found no difference in those trees planted over the drains from those that were not, the disease was much the same. The orchard was well cultivated and esteemed by many a model orchard. The orchard contained 500 dwarfs and 150 standards.

The standards stand as follows: Madeline, five, all gone; Belle Lucretive, ten, all gone; Dix, three, no blight, healthy; Canandaigua, one, healthy; Doyenne d'Ete, five, all gone; Pound, three, all gone; Osband's Summer, three, all gone; Kirtland, all gone; Lawrence, five, no blight, healthy; Beurre Clairgeau, three, a little blight on two of them; Bartlett, ten, all gone; Rostieser, five, all gone; Beurre Bosc, five, blighted a little, all living; Flemish Beauty, ten, blighted badly, nearly all gone; Ananas d'Ete, three, Seckel, eleven, and Bloodgood, have each blighted badly; Winter Nelis, no blight.

The dwarfs were as follows: Rousselet Stuttgart, five, all gone; Glout Morceau, five, all gone; Vicar of Winkfield, ten, all gone; Urbaniste, twenty, all gone; Howell, ten, blighted badly, two left; Doyenne D'Alençon, ten, all gone; Tyson, ten, no blight; Beurre Diel, ten, blighted badly, half gone; Kingsessing, five, blighted slightly, all living: Figue D'Alençon, ten, ditto; Beurre D'Anjou, ten, blighted badly, half gone; Seckel, ten, blighted slightly; Beurre Langelier, ten, all gone; Catilac and Napoleon, each five, all gone; Beurre Superfin, twenty, blighted a little, all living; Duchesse D'Angouleme, thirty, but very little blight, but one actually lost; Beurre Giffard, ten, no blight; Nouveau Poiteau, five, all gone; White Doyenne, twenty, blighted little, but cracks badly; Beurre D'Easter, eighteen, all gone; Louise Bonne de Jersey, twenty, blighted badly; Belle Lucretive, fifteen, all gone; Buffam, ten, blighted badly, only two or three left; Jaminette, ten, all gone; Osband's Summer, Stevens' Genessee and Soldat Laboureur, five each, all dead except one of the latter.

Dr. Spalding asked if Mr. Mason had tried "root pruning?"

Mr. Mason said he had not. It was some of my best land; enriched it a little at first; had not manured since, but cultivated thoroughly up to 1866, but not so well since that time. It is a clay or post oak soil.

Mr. Trabue asked if he had tried cutting back for blight?

Mr. Mason—Had tried cutting where the blight began on the limbs; but in some instances it began on the stem, and in some cases the tree died at once. Cutting has been successful when it was only on the small limbs. Finds no difference between standards and dwarfs in respect to this disease.

N. J. Colman—This is a sorry picture of pear culture. I have had a longer experience in pear culture than this, and been much more successful. This experience just detailed should not be held as binding on members of the Society in making selections. Mr. Mason's experience and mine have been widely different in some varieties. If Mr. M. had had a careful man to detect the blight in its early stages, and cut back, it would not have been so. In many cases the trees could have been saved by cutting, before the whole sap was vitiated. This experience would come like a bombshell among cultivators. Much of this blight is due to the culture; the drainage and enriching produces too rank a growth of wood. I planted, in 1856, four to five hundred trees, and have lost some twenty to thirty trees; these died by not arresting the blight by cutting back below the part affected. Some of these very varieties just named have escaped with me; Seckel, for instance, of these I have never lost one; Bartlett is another which has done well. I prepared the ground well before planting; gave good culture two or three years, and but little since. I have seen the blight, but when it appears at once cut it out. The experience of *one* man should not deter others from planting.

Mr. Mason—I may have failed in giving the right culture, but I gave it good, careful culture; it was called by all who saw it a "Model Orchard." Did not give it high culture, especially during the last year or two, for I let it run into grass. Sometimes the blight first appears in the body of the tree, near the ground. My neighbor, Mr. Gore, planted in 1858; he gave far too little culture, and he lost his before I lost mine. They did not make too much growth of wood.

Mr. Mudd—There may be some blight; it may not be entirely prevented, but we can manage, I think, so as to have the fruit at least to use in the family.

Mr. Mason—Had got some very fine fruit.

Dr. Spalding—During the entire existence of the Society I have opposed dwarf pears. The object of planting upon the quince is to induce fruit by checking the growth. I have failed to see dwarfs give more than four or five crops of fruit unless rooted on the pear. There is a method of treating standards, by which you can get the fruit early upon the pear stock. I refer to root pruning. I have observed this practice in five or six orchards in Illinois. We can root-prune, and thus prevent wood growth in the fall. There is great difference in varieties. Some are more vigorous and more liable to blight than others, and we must adopt a course of treatment that will prevent this late growth in the fall. This we can do by root-pruning in August. By this vigorous growth, the wood fibres are disposed to form wood buds, but by checking them by root-pruning they take a slower growth and form fruit buds. Sometimes buds take the fruit-bud form in the first growth, and become, by late growth, wood buds in the fall. Good culture in this case is indispensable, because we must have good, well-developed growth, but we check this growth in the fall. As to Mr. Mason's orchard, it has had good culture; the only thing lacking has been thorough root-pruning of the trees. The Seckel has blighted, and it is almost universally a healthy tree. It is only high cultivation that has given the Seckel this disease. First, plant standards; next, cultivate well, then root prune.

Mr. Mason—Root pruning has been tried by Henry Shaw; he root pruned both standard and dwarfs, and without any success. He has also paved the ground beneath the roots of the tree before planting.

Dr. Spalding—Mr. Shaw has not root pruned anything like half. I don't call it root pruning at all.

Mr. Mudd—Doubts the benefit of root pruning; would not entirely condemn dwarfs; has some that bear abundantly. There are some old pear trees near Kirkwood that are perfectly healthy; grow in a yard with no cultivation.

Dr. Spalding—Does not regard root pruning as a perfect remedy; but it is perhaps essential. Those who have failed with it did not go deep enough. Some of the trees have been taken up entirely, and replanted in the same place, being thus maintained healthy and fruitful.

Mr. Mudd—I don't like to leave the pear at this point. The pear culture seems a mystery. If it is only by root pruning we can have pears, but few trees will be planted. I am not satisfied that Dr. Spalding is quite right, nor can I subscribe to throwing away the dwarfs. I have dwarf trees only five feet high; a Des Nonnes, that has given me large crops. Duchesse has given me good fruit. I had a fine orchard in '65; Mr. Husmann called it the best he ever saw, and within ninety days two-thirds were gone. Some of the Bartletts are good. If I could get fine crops of Des Nonnes, I would plant ten acres of these. There is possibly in this point of fall growth a great deal. Dr. Hull, of Alton, Illinois, has pointed out another disease that is injuring the trees, a *fungus* on the roots. I have four or five pear trees planted long ago, never plowed, the trees are as thick as my body, they are yet quite healthy. We have yet much to learn on this subject.

Dr. Spalding—Root pruning, to be a success, must be thorough. Make a trench quite close to the tree as if you were going to take it up, cut every root, and throw back the same soil. I visited the beautiful orchard of Mr. Kendall, of Upper Alton, Illinois, it contains 4,500 trees, it is the most beautiful orchard I ever saw. The blight was just beginning. Some of the trees were past help. He was advised to take out the diseased trees and root prune, he did it much as Mr. Shaw, did and said it was a failure as he saw no improvement. When Dr. Hull spoke to him of it, he called in the man who did it, and asked him to show how thoroughly it was done. The man said I took up the ground a spade deep all round. When Mr. Kendall became aware of the facts of the case, he had it done over again thoroughly, and most of the trees are now in good health. This orchard cost over $10,000. Dr. Hull has lost only about one per cent. by blight.

Dr. Edwards—These experiences are very important, and I hope they will have their full effect. We must have such facts as those stated to guide us. I find that there are some varieties that succeed well in one place, but will not do in another. Dr. Long, at Alton, planted some pear trees. Some were taken into his lawn, and did well, others, of the same varieties, were well cultivated, and they died. I think in transplanting they cut off too much of the tap root. A tree now at twenty years, is thought an old tree, but formerly trees lived fifty to sixty years or more.

Adjourned.

AFTERNOON SESSION.

The election of officers being the special order,

The President appointed T. W. Guy and C. W. Murtfeldt, tellers.

The several ballots being duly taken, resulted in the following election:

PRESIDENT,

Rev. Charles Peabody, St. Louis, Mo.

VICE PRESIDENTS,

First Congressional District—J. M. Jordan, St. Louis.
Second " " —T. W. Guy, Jefferson county.
Third " " —J. B. Olhausen, Cape Girardeau county.
Fourth " " —Felix F. Fine, Greene county.
Fifth " " —F. A. Nitchy, Cole county.
Sixth " " —G. M. Dewey, Linn county.
Seventh " " —H. M. Vories, Buchanan county.
Eighth " " —O. H. P. Lear, Marion county.
Ninth " " —A. E. Trabue, Ralls county.

CORRESPONDING SECRETARY,

C. W. Murtfeldt, St. Louis county.

RECORDING SECRETARY,

William Muir, Fox Creek P. O., St. Louis county.

TREASURER,

J. H. Tice, St. Louis.

President nominated as a Business Committee, Messrs. Jordan and Trabue.

After the election of officers, for 1869, the society proceeded to the order of the day, viz:

REPORT OF COMMITTEE ON VINEYARDS.

Dr. C. W. Spalding, Chairman, read the following report:

Grape growing in Missouri is rapidly increasing, and has already become an important, if not the most important, fruit-growing interest in the State. While our markets are liberally supplied with grapes of excellent quality, and at prices much below those of former years, the great bulk of the crop still goes into wine. Near the large markets it will, no doubt, be found profitable to sell the fruit of certain varieties for some years to come, but we must all look to wine making as our principal object. That the wines of Missouri are destined to take a high rank in the markets of this country there can be no doubt, and if the producers will be content with moderate, or, compared with former rates, with low, yet remunerative prices, there need be no apprehension about an overstock; provided the wines are of good quality, of their respective kinds. The custom so generally praticed of making wines from a single variety of grape is one that will probably gradually give way to an intelligent mingling of varieties, as experience enables us to determine what kinds can be mixed to advantage. The adding of ten, or even as low as five per cent. of the must of Norton's Virginia to that of Concord evidently improves the latter and renders it much more acceptable to many tastes. Experiments in this direction are needed to further determine what flavors will mingle kindly, and I would call the attention of vine-growers to this point, and earnestly invite them to make trial of such varieties as will in their judgment unite harmoniously in their flavors.

At the suggestion of the President of this society, and in conformity with the expressed wish of a majority of this committee, it was decided that the different members of the committee should make individual reports upon the vineyards in their respective districts. Mr. H. M. Vories, of

St. Joseph, however, preferred to report to me as Chairman, and the substance of his report is embodied in this paper.

The grape crop of 1868, so far as I have ascertained, has been excellent throughout the State. The wines of this year promise to compare favorably with those of 1867—a year of unusual excellence. While many other grape-growing sections of the country have suffered in one or both of the last two seasons from the diseases to which the grape is liable, we have been blessed with two successive years in which the crop has been abundant and the quality excellent. Even the Catawba, the most liable of all our prominent varieties to be effected by rot, has with few exceptions been quite exempt from its attacks, and fine crops of this old and popular sort have been harvested.

My visits during the season have not been confined to our own State, but have extended over portions of other States, including those of Central Illinois and Indiana, Northern and Southern Ohio and Western Pennsylvania. In all these, great interest is manifested in grape culture and the planting of new vineyards is progressing favorably.

In our own State, especially in the central and southern portions, the "Concord" and "Norton's Virginia," continue to be the leading sorts planted—the latter for wine, and the former for both market and wine. In the northern portion the "Catawba" is still planted to some extent. The "Concord," however, predominates here as in other parts of the State. Nothing has yet taken the place of the "Hartford Prolific" as an early market grape, and though poor in quality, a *few* are still planted for that purpose. The "Ives" is still on trial, yet up to this time I have not learned that wine has been made from it in Missouri. I do not propose to speak in detail of the newer varieties, and therefore mention only a few of the most prominent. I cannot, however, drop this branch of my subject without calling attention to the hybrids of Mr. Charles Arnold, of Paris, Canada.

Last spring I received from Mr. A. five of his new hybrids, and in the fall samples of fruit from each, grown in Canada. With the quality of the fruit I was much pleased, it being sprightly, vinous and devoid of hard pulp. Two of these samples appear promising for wine. I shall report further upon all five after fruiting them myself. They are all hybrids of foreign kinds upon the Clinton, and all, I believe, ripen early. The plants have done well this season.

While looking over the vineyards near the line of the Iron Mountain Railroad, rot was discovered among the fruit of the Concord. This new feature of this popular variety somewhat startled the examining party, and caused considerable speculation as to the cause. As it then appeared to be limited in the red soils, known as the iron soils of this region, it was attributed to the mineral characteristics of the soil. This may prove to be the true cause, but I have since been led into doubt on the subject, from having observed an equal, if not greater per cent. of rot in the same variety on soils widely different from those of the iron region. I think I am safe in stating that in every instance coming under my observation where the Concord has rotted in our State the vineyards have been planted on new land, lately redeemed from the forest. The question strongly suggests itself to my mind, whether the rot may not be wholly due to the presence in the soil of the large amount of decaying wood which exists unavoidably in all newly cleared lands. If this suggestion should upon further observation prove to be well founded it will be of great value in the selection of vineyard sites. There is, however, another fact which would seem to favor the hypothesis, that the rot was caused by some peculiarity of the soil. In Southern Ohio, where the soils are essentially different from most of the grape soils of our State, the Concord has always rotted to considerable extent. I am not aware that these soils of Southern Ohio abound in oxides of iron, yet it would be fair to presume that they are not well suited to the growth of the Concord. The Norton's Virginia and the Ives have both been successful in these soils, and this fact may convey a useful hint to those who are planting vineyards on the red soils of our own State.

Mr. H. M. Vories, of St. Joseph, a member of the committee, reports to me about 120 acres in vineyard in his vicinity, of which some 25 acres are in the State of Kansas. He concludes his report as follows:

"I know of no instance in which the Concord has failed to yield a good crop of grapes in this county, and ripen the fruit well. In fact, I may say, that this is the home of the Concord. The Hartford Prolific, so far as tried, has also proved hardy, healthy and productive. The Norton's Virginia has succeeded well on my grounds. I have had about one hundred vines in bearing for three years; each year I have received a good yield. This year, remarkably so, and the berries perfect, with large, fine clusters. The Catawba succeeds well upon favorable localities. High, light, warm land, inclined to sandy, is best. Other varieties not sufficiently tested, but several promise well. In fact, we now look upon grape growing in this part of the State as a success. There no longer seems to be any doubt in reference to the profitable culture of the grape in this part of the State. There is now a growing interest felt upon the subjects, and vineyards are starting up all through the country. In Holt county, in Andrew, Buchanan, Platte and other counties, people are becoming fascinated with grape growing, and, in fact, with fruit culture generally, and we expect to see wine one of our most profitable productions in the next few years.

"I will just add that the vines in the first vineyards here, were planted four feet apart, each way; but we are now planting them six feet apart, and some six by seven feet, and others talk now of eight feet. Our vines are not generally trimmed or pruned so closely as formerly; we have generally become satisfied that they do better to let them have more wood."

Mr. Vories also writes me that about fifty vines of the Ives this year fruited lightly in Kansas, opposite St. Joseph. The foliage of these plants turned brown in August. They stand in rich land, and have made a very vigorous growth. The proprietor thinks they will do well on lighter soil.

My visits to the vineyards in the States lying east of us were made in connection with a part of the *ad interim* committee of the State Horticultural Society of Illinois.

The thanks of the party and of the Horticulturists of the country are due to most of the railroad lines over which we traveled. The liberality and promptness of W. D. Griswold, President of the Ohio and Mississippi Railroad Company, in sending us passes by telegraph, are to be especially commended.

Mr. Messler, Assistant President of the Pittsburgh and Fort Wayne Railroad; President Hovey, of the Cleveland, Columbus and Cincinnati Railroad; General T. A. Morris, of the Indianapolis and Terre Haute, and Captain J. E. Simpson, of the Terre Haute and St. Louis Railroad, have all laid us under lasting obligations by the readiness and polite cheerfulness with which they gave us free passes over their respective roads. On a former excursion in this State, when the party consisted of ten, we were similarly indebted to the liberality of the Iron Mountain Railroad Company for like favors.

At the Longworth's Wine House, of Cincinnati, through the politeness of the proprietor, Capt. Anderson, we had an opportunity of comparing the relative merits of several of the newer kinds of wines. The record of this House showed the must of Concord and Ives were of equal weight, 80°; and also that the per cent. of alcohol contained in the wine of each of these varieties was almost exactly the same, being respectively 11.4 and 11.5. The wine from the Rentz, which has heretofore taken a rather low rank as a still wine, has proved valuable for sparkling. Capt. Anderson regards it as superior to all other American wines for this purpose, and perhaps equal to the finer Champaignes of Europe.

At the time of our visit, the Cincinnati Horticultural Society were holding an exhibition, conjointly with the Grape Growers' Association. At this exhibition, which, by the way, was a magnificent affair, were shown several new varieties of grapes. Among them were two or three Hybrids, crosses of foreign varieties on the Delaware, presented by Mr. George Campbell, of Delaware, Ohio. One of these was regarded as promising. Also, Eumelan, now being disseminated by Dr. Grant, of New York. This is a small, dark grape, bunch small, shouldered, somewhat open, skin thick, pulp soft, melting, without hard centre, seeds rather large for the size of the berry; quality good, regarded as promising for wine, but too small in size for a popular market fruit.

A single bunch of the Salem was also shown, and fully maintained its character as one of the best of the Rogers' Hybrids.

The grape tables were chiefly adorned with a splendid display of the fruit of the Ives, which is decidedly the most popular wine grape of Southern Ohio. It is claimed for this grape that it is the equal of the Concord in both hardiness and productiveness. This is no doubt true in the valley of the Ohio, but it yet remains to be proved in the wine-growing districts of the country. This variety is tardy in coming into bearing, not giving fruit till the fourth season after planting. Established vineyards of this grape, near Cincinnati, were visited, where the crops were found to be all that could be desired, and the plants healthy.

Passing on to Pittsburg, we called at the well-known fruit farm of Mr. Knox. Mr. K. has between thirty and forty acres in vineyard, a large part of which is in bearing. With him the Ives ripens with Hartford Prolific, and is all marketed before the Concord, the foliage, however, not quite as good as the latter. Having a thick skin, the fruit will, however, hang upon the vines longer than Concord, and in Ohio is not picked for wine-making till quite late in the season.

Martha, here as elsewhere, proves to be a hardy, vigorous grower, and Mr. K. claims that it is as productive as Concord. Judging from the size of both bunch and berry, I should doubt if it would yield as many pounds per acre. It is a week or more earlier than Concord, and markets well, and may be safely set down as the most promising, for both table and wine, of all the white or green grapes that have yet been disseminated.

Taylor and Cuyahoga—Worthless in this locality.

Delaware—Immense crop, but half the foliage gone. Appears to do best when trained very close to the ground, say within ten or twelve inches.

Creveling—Doing remarkably well, the bunches being more compact than is usual with that variety.

Anna—Succeeding well; crop fair; foliage good.

Foliage of the Clinton almost wholly destroyed by the gall louse.

In the latitude of Pittsburg the season proves too short, and the winters too severe, for the Herbemont. Young vines not covered were killed back last year. Old vines, covered in winter, have a large crop, but fruit does not mature.

Diana also requires a somewhat longer season, but is good when the frosts hold off late enough for it to ripen.

Elsinburg and Alvey are of fine quality, but suited only to amateur culture.

Black Hawk—This new variety, a twin seedling of the Martha, is similar to Hartford Prolific, somewhat better in quality, more tender in the pulp; berry rather small; bunch medium, with a foliage of the Concord class. The vines were yet young, and the fruit may improve with age.

The Catawba shows a healthy foliage, and no rot. Owing to the shortness of the season, the fruit does not ripen oftener than once in three or four years.

Norton's Virginia is not suited to this section, and does not here develop its splendid wine qualities.

Maxatawney succeeds well with Mr. Knox, and Iona tolerably well; foliage defective.

Twenty-two of Rogers' Hybrids, obtained from the originator, all in fruit presented a good opportunity for determining their relative merits. It is unnecessary to describe them here, and I only mention them with very brief remarks. No. 4, best of the set, taking both fruit and foliage into the account. Salem ranks next; after them, Nos. 9, 41, 3, 5, 19, 15, 13, 14, 30, 33, 36, 44, 7, 43, 32, 39. Nos. 2, 28 and 34 were yet too unripe to judge of their quality. The foliage of these Hybrids is not such as would be chosen for the summer temperature of Central and Southern Missouri, though some of them will probably succeed on northern slopes. They seem, however, to be better adapted to cooler climates.

The older parts of the vineyard were planted 8x8 feet, the latter plantings 8x6 feet, with trellises eight feet high. Omitting one foot for space below the lower wire, each plant is allowed 56 and 42 square feet of trellis, respectively. The trellises are at least two feet too high for convenience.

The renewal plan on horizontal arms is the general method of training, and has been well carried out and preserved.

Of the wines produced from this vineyard, that made from a mixture of Delaware and Anna was best, and that from Delaware next. None of them were of a superior quality.

In the vicinity of Cleveland the foliage of Iona and Rogers' hybrids was better than at Pittsburg. The former, as elsewhere, being nearly defoliated before the maturity of its heavy crop of beautiful fruit. It is, however, proper to state, that it was claimed that the foliage of the latter varieties was not as good this year at Pittsburg as formerly.

Some of the Lake shore growers give a preference to No. 3, among the hybrids of Mr. Rogers, yet all agree that No. 4 is enormously productive, of large and excellent fruit. It is due to the Salem to state in this connection, that its foliage was in better condition on the Lake shore than that of any of the other of the Rogers' Nos.

There can be no question that the Rogers' grapes are true hybrids. In foliage they may be classed with Catawba and Iona, while the best of them are superior in foliage to the latter grape.

Near Cleveland we first met the Mottled grape. This belongs to the Catawba family, of which it is probably a seedling. In foliage we could discover no preference over that of its probable parent. The fruit is beautiful in appearance, of purplish red color, mottled with light red. Bunch medium to large, shouldered; berry above medium, round; skin thick, very astringent; pulp juicy, with a large hard center; quality only good.

On the Lake shore the grape crop was free from rot, but on the Islands, which we did not visit; we were informed that the Catawba had rotted badly, some vineyards losing half the crop from this cause. The vineyards on the main shore are generally younger than those on the Islands, but whether the age of vines, excepting when very young, has any connexion with the appearance of this formidable disease, is a point on which we do not feel prepared to express an opinion.

Dr. Kirtland thinks that the main shore will be exempt from rot, by reason of the underlying soapstone which is found in some localities within two feet of the surface. The Islands are underlaid with limestone.

Frost occurred in this vicinity about the 22d of September, and at the time of our visit, the end of the month, its effect on the foliage were plainly discernible.

As an item of interest to the producers of grapes for market, we obtained the quotation at

Cleveland, where entire crops were taken on contract. These prices are for the fruit delivered in the city of Cleveland, in baskets ready for packing.

Concords, 7 cents per pound.
Delaware, 12½ cents per pound.
Catawba, 6 to 8 cents per pound.
Isabella, 4 cents per pound.

Pursuing our journey homeward, we reached Indianapolis just in time to be present at the Indiana State Fair.

Here we found a handsome collection of grapes on exhibition. We enumerate Concord, Ives, Isabella, Israella, Iona, Delaware, Lyman, Blood's Black, Hartford Prolific, Pauline and Walter. The latter was grown at Poughkeepsie, N. Y., and being a new variety, a description of the fruit is here given. Bunch medium, shouldered, moderately compact; berry medium, slightly oval; color red tinged with blue; skin thick; flesh rather firm. Without hard center, juicy, sweet, somewhat aromatic; very good. We knew nothing of its foliage, excepting what may be inferred from its parentage, but shall look with interest to the testing of this variety in our more southern climates.

All the others named above appear to be giving satisfactory results in Central Indiana.

I cannot close this report without calling attention to the importance of foliage in all new varieties brought before the public. Disseminators of new varieties place too much stress upon the quality of the fruit, and do not sufficiently regard the character of the foliage.

Our best localities for wine will be found in the more southern portions of the true wine districts, and any grape with a foliage that will not withstand the summer temperature of that region and retain it till the end of the season, is, in my opinion, unworthy of general cultivation, and its introduction should be earnestly discouraged. Until a grape has proved itself capable of ripening five successive crops of fruit, under good vineyard treatment, without loss of foliage or disease of the leaf or berry, it must be regarded as not having established a claim to general introduction.

At the conclusion of Dr. Spalding's report on vineyards, the following discussion took place upon the general subject:

Mr. N. J. Colman—I wish to know if there is any way to prevent Concord grapes from bursting their skins. In my vineyard we had a long drouth, then heavy rains and the grapes burst badly.

Dr. Edwards—I was in hopes we would have many more of our Boone county friends present to hear facts presented in regard to the culture of the grape. Success in the culture of the grape will stimulate its increase. Let me state some facts. In my neighborhood, in a vineyard of two acres, Mr. Hoffman sold grapes to the amount of $1,400, and, from the same two acres, 800 gallons of wine had been produced. This was the third year of their bearing. The varieties were mostly Concord, with Delaware and Hartford Prolific. Another of three acres, produced $1,500 worth of grapes and 1,500 gallons of wine. Mr. Leffingwell had made 4,000 gallons of wine, worth $6,000, from two acres.

This is from lands not anything like as good as these lands in Boone county, and yet more money is made in a year from two to three acres than is made by any farmer in Boone county.

By using the plow and cultivator a hand can manage from three to five acres a year. If we sell grapes at four cents a pound we can make more still than any farmer.

Dr. Spalding—When any man makes the statement that he has produced 1,500 to 2,000 gallons of wine from an acre, he has gone to the *pump*. They may make 600 to 800 gallons Concord; 400 to 500 Ives'; more than this of Norton, and a better wine.

The Ives makes a very pleasant wine. I have had many ladies try it, and they were delighted with the flavor; you may take the other native wines, and they have to learn to like them, they get accustomed to them. I have planted the Ives largely for this very feature.

In answer to a question—would plant Ives on a southern slope?

Mr. Dewey—I raised my first crop of grapes on one acre; sold $200 worth of fruit, and made 400 gallons of wine; lost by the birds about a fourth of the crop. Have a southeast slope; soil, a sandy loam.

N. J. Colman—I would like to have some expression of opinion as to the price at which it is most profitable, to sell in market, or to make into wine. Whether it is best to sell grapes at 8 or 10 cents a pound, or make wine and sell at a dollar a gallon? There is a growing demand for grapes at ten cents a pound. Is it better to sell at that or sell wine at from a dollar to one and a half?

What would be the cost of making wine?

Dr. Edwards—I have tried to ascertain this from the growers; tried it in several ways. Most of them said if you get 9 to 10 cents a pound for the fruit, sell and pay the commission.

Dr. Spalding—This, of course, applies to Concord. Norton is worth more. As to the number of pounds of grapes it takes to make a gallon of wine, some have said it takes four pounds and a half to the gallon, but I cannot get more than half a gallon from that. The Concord will yield 400 to 600 gallons per acre; very much depends on the treatment. It takes from 10 to 13 pounds to make a gallon of wine. The Norton has been estimated at 14 pounds to the gallon, but I think this is too low, it will often take more say 15 to 16 pounds. The Ives comes between the two, taking perhaps 12 pounds, or less than Norton and more than Concord. Think that if the Ives and Concord give a good crop, it will be about a gallon a vine. We have all a certain influence we can exert. We should recommend the use of good wine in preference to bad whisky. It would be well I think, if a place could be established where wine can be obtained at five cents a glass. Good, pure wine has a good effect on the system, which is not the case with strong drink, and can be used as an article of diet.

Dr. Edwards—A few words more upon the planting of the grape may save some trouble. When I began to plant 5 to 10 years ago, I planted 4 feet by 5; now, for the Concord, I plant 8 by 12 to 16 feet. It makes a marked difference in the labor, and in five years you will have more fruit, and the vines will last longer.

The Concord, with room, will give 100 pounds of grapes to the vine.

The President announced the following committee on fruit upon the table:

C. W. Spalding, H. T. Mudd, T. W. Guy and Wm. Stark.

REPORTS FROM VICE-PRESIDENTS.

J. M. Jordan, Vice-President from the First Congressional District, said he had no written report, that he had but little experience outside of his own place to give. He would call attention to what he thought an improvement in training grapes, it was his slanting trellis.

He thinks that by using this trellis there are several benefits. One is, that in seasons like the last, when there is much rain, the grapes hang quite free, the rain runs off and the perfect circulation of the air among the bunches prevents them from bursting.

The Vice President of 2d district being absent, no report was received from that district.

Mr. Alva Culver, Vice President from the 3d district, reported as follows:

Ste. Genevieve, Mo., November 20, 1868.

Mr. President and Members of the Missouri State Horticultural Society:

Thanking you for the honor you have conferred, I will account for my absence from your annual meeting, and also for the meagreness of my report, by stating that I am confined to my house with pneumonia.

Increasing interest in the cultivation of fruit is very manifest in this Congressional District. The apple and the peach of the cultivated kinds were the past season a failure, with few exceptions on quite elevated sites, while the summer apple, closely planted by the early settlers, bore well in the bottom lands.

The Concord grape is many hundred per cent. in advance of all others, and has fully met the expectations of its numerous admirers.

The almost discarded Catawba has done much better the past season than at any previous time for the last seven years. A neighbor of mine has made from this variety 600 gallons of wine from a single acre. He practices annual pruning of the surface roots, and says the vines hold their foliage till the fruit thoroughly ripens.

Mr. F. F. Fine, Vice President from the 4th district, who is also President of the Greene county Horticultural Society, sent the following:

To the State Horticultural Society:

The Greene county Horticultural Society, recently organized at Springfield, Missouri, by resolution require their secretary to report to your body our existence as a county society, and willingness to co-operate with the State society in future. I am also required to report such information as I may possess, and as may be placed at my disposal by members of the society. The duty could not have fallen upon one more willing, but I regret it was not assigned to one more able to state to you facts of importance to ourselves and others respecting the horticultural prospects and present condition of the county. I regret also the shortness of time afforded me previous to your meeting at Columbia, where we sincerely hope for you a most social, pleasant and profitable session.

Were I to speak of Southwest Missouri as a whole, I must call it one vast, well adapted horticultural field, now ready for the pursuits of the sanguine horticulturist; but I have to say most of Greene county, whose

Situation is upon what is termed the Ozark mountains, an elevation above miasmatic influence, remote from stagnant water or low wet lands, possessing a free, pure, dry atmosphere, so healthful to both animal and vegetable life, and favorable, we think, to the formation, growth and perfect maturity of all the fruits adapted to the west.

SOIL.—Two-thirds, perhaps, of the lands of this county are timbered. The heaviest timber and deepest soil are found upon the streams. This soil, though bottom land, is dry and very productive. Some of the largest fruit trees, and the oldest, are growing in this bottom land, yet healthy and fruitful.

The timbered uplands possess a soil of lighter color, yellowish, excepting the surface, which is darkened by vegetable formation, leaf mould, etc. This is fertile with a subsoil of reasonable depth, which is underlaid with a bed of gravel about two feet of average depth resting upon the clay. This strata or bed of gravel between the soil and clay bed we call nature's own means for thorough draining. About half of this timbered upland is stony, hard to work, sold at low prices, but perhaps good fruit land.

The prairie land is of a yellow, dry, productive soil, underdrained also by the gravel bed at a depth of generally about two feet.

Nature has not only given a good soil well drained, indicating a good fruit country, but furnishes ample proof of the country's adaptation to horticultural pursuits in the spontaneous demonstrations of growth and fruitfulness of the wild apple or crab, seen in great numbers in our county. She also, annually, hangs up for exhibition millions of native clusters of beautiful grapes upon the branches of our forest trees. As an intimation of the future success of cultivated small fruits here, she makes the deep, rich bottom lands her sample grounds for berries. The tall, strong canes of the blackberry and raspberry are made to bend to the earth with a most convincing crop of delicious fruit. The prairies are almost fragrant with the smell of millions of wild strawberries crushed by the hoofs of grazing herds. Nature's suggestion of this kind induced the planting of orchards by early settlers as early as 1830. Many of those old apple trees are here yet, alive and fruitful. Some are said to bear yet forty bushels each. The success of experiment has caused others to follow example, until almost every old farm here has an orchard of at least apples.

The past season gave us a much lighter crop of apples than usual—not over one-fourth a crop, now retailing at $1.25 per bushel.

There is a manifest growth of interest in the subject of horticulture, as evinced in the demand for trees. This county has six nurseries near Springfield, with about 500,000 apple trees. Besides draining the nurseries, thousands of dollars are paid to tree peddlers.

Most of the eastern varieties of the apple that are adapted to the west are grown here, and with better success than the same varieties east. This is well attested by eastern visitors who have eaten of our apples with surprise at their superior size and flavor.

We have a few local varieties of merit. I will name the "Ingram" seedling, from Rawle's Janet, by Martin Ingram of this county—superior to its parent in appearance and hardiness—keeps much longer—season, June and July. I sent you samples last week.

Another is called Roberson's Pippin, and adopted by our society by that name. It originated with Mr. Roberson of this county, father of Dr. E. T. Roberson of this place. It is also a winter apple, above medium, greenish yellow, melting, good—rather shy bearer.

THE PEACH seems more at home here than in any other portion of the State we have seen, though most trees in bearing are seedlings, some of which are valuable. The budded varieties are being grown and planted with promise of success, but not yet fruited sufficiently to enable me to say more.

PEARS.—As far as tried, promise well. The old seedling trees first planted here are here yet, full of vigor and so large as to look like so many forest trees. The improved varieties, both dwarf and standard, are being tested with success. Mr. A. J. McCracken, five miles from town, has planted largely of the leading pears, and is receiving some fruit from Bartlett, Osband's Summer, and others, which are doing well. Messrs. Vaughn & Kirchgraber, who are planting a fruit farm near town, are also growing pear trees up to fruiting size with success.

CHERRIES.—The Morello and a few of the Duke's succeed well, but the more tender varieties are a failure.

PLUMS grow wild and bear fruit in abundance. The cultivated varieties grow, too, and are fruitful, but are claimed by the curculio.

GRAPES.—Most varieties that are termed hardy do finely here. The Concord, Hartford Prolific, Delaware, Norton's Virginia, Clinton, Northern Muscadine, etc., these are grown successfully. We have the Ives and several others, which have not fruited for us yet.

There are, perhaps, 25 acres of vineyard in this county—a large proportion of Concord. Mr. A. J. McCracken has 13 acres; Messrs. Vaughn & Kirchgraber are the next in size. Many have been looking to their experiment, intending to govern their actions by success or failure. Many are planting.

We may be allowed, just here, to speak of our neighbors. Wright county is horticultural. One man has planted 40,000 fruit trees. Two of his neighbors have ordered, for their own use, 18,000 grape cuts, besides some rooted plants. Webster county has paid $4,000 for fruit trees imported from eastern nurseries. This county is well adapted to the culture of apples, peaches, grapes, etc., and the people have "found it out." Much interest is being manifested on the subject.

A variety nursery is being established at Marshfield.

Two hop yards are in operation, having yielded a fine first crop this year.

Grapes are receiving considerable attention in Webster, and with success in fruiting the leading varieties. The Delaware has there been grafted upon the native or wild grape, resulting in a good healthy growth and plenty of fruit.

Newton, Jasper and Barry are also making advancement with the grape and fruits generally. Such is the soil and general adaptation of these counties that, with proper effort, they must succeed.

F. F. FINE, *President.*

D. S. HOLMAN, *Secretary.*

No reports were received from the 5th and 6th districts.

Mr. H. M. Vories, of St. Joseph, Vice President from the 7th District, made the following report:

To the Missouri State Horticultural Society:

As Vice President of your society from the Seventh Congressional District, I submit to your society the following report:

1. I will state that in this part of the State, horticulture is largely and rapidly on the increase. The disposition amongst the people to plant fruit trees, of almost all varieties, surpasses anything that I have seen at any time or at any place.

The apple crop in this portion of the country the past season was not a full one, in fact, it may be said to be a light crop; but the quality was very fine, and the fruit was readily sold at large prices, so that the disposition to plant trees has rather been increased than diminished. Almost all good varieties of apples here succeeded well, the trees are healthy and bear well, as a general thing. The Winesap, Janet, Ben. Davis, and White Winter Pearmain, seem to be the most approved varieties of winter apples. Pears are being planted here to a considerable extent, but not with universally good results. The crop the past season was almost a failure, and the trees in most orchards were greatly affected and injured with blight. We are anxious to know whether there are any good varieties which are not subject to blight. If this difficulty could be overcome, there is no country where pears will succeed better than here.

The peach crop last season was a fair one, not so large as the year before, but enough so to be encouraging to planters. The quality of the fruit was very fine—all that could reasonably be desired. A great many trees will be planted the coming spring. The only drawback to peaches here is the curculio, and our hard winters which frequently kill the fruit-buds. Small fruit, such as raspberries, currants, strawberries, etc., have not been largely cultivated in this part of the State, but the result as far as they have been tried is such as to be encouraging.

The grape crop the past season, (and I may say for the last five seasons), has been of the most encouraging character. The crops have been heavy and the fruit of the best quality.

The Concord, Hartford Prolific, Virginia Seedling (and the Catawba in favorable locations), are succeeding well, and all of those named except the Catawba seem to flourish and be at home on almost any soil or situation. The Clinton, Delaware, Diana, Herbemont, Ives seedling, North Carolina seedling, Iona, Israella, Isabella, Taylor's Bullitt, Rulander, Rogers No. 2, 3, 4, 15 and 19, Allen's Hybrid, and in fact a great many other varieties are being tried, and mostly promise well, but have not been sufficiently cultivated to justify their culture to any great extent, but a great many persons are planting all of the varieties named, and many others, all of which will soon be tested. Grapes are now planted here with as much confidence as corn, or any other common farm product.

In conclusion, I may say that the prospects for horticulture in this part of the State is of the most encouraging character, and the time is not far distant when this region will be known as the great fruit-growing region of the Western States.

The Vice President of the Eighth District having failed to prepare a report, in the place of it, Mr. A. E. Trabue, of Hannibal, from the same district reported as follows:

We had a fair prospect of fruit this year. Our soil was covered with several inches of snow for several months during the winter; thus in the severest weather protecting trees, shrubs and roots from injury. The very full bloom in the spring of all kinds of fruit trees, not excepting the most tender varieties, seemed to confirm the most ardent hopes of the pomologist.

But, unluckily, in the vicinity of St. Louis especially, while the peach tree was in full bloom, there came a nipping frost that at once in a night destroyed all hopes of a crop of this delicious fruit in that latitude. Those who had made a prudent provision of any kind of rubbish that would raise a smoke to meet the emergency were then rewarded for their foresight, while others, the careless and ignorant, went without this fruit, of their own raising, for the balance of the season. In our neighborhood, in Ralls and Marion counties, the peach buds were not sufficiently developed to be injured by this frost; and thus in this latitude we had a superabundance of peaches, both natural and grafted. Some orchards, apparently well situated for success in this line, and yet had not borne a specimen of a peach for four years, had this year more than they could market, dry, can or even gather. One, however, whose orchard was planted ten years ago on a high bluff above Hannibal marketed $4,000 worth of fruit three years ago on twelve acres, and this year, it is believed, more than double the product. The orchard of the writer, not so favorably located as the above, yet had a more abundant crop than his neighbors' in like situations; chiefly, as he believes, by resorting to smoke after a frosty night, and the promise of a fair and warm morning to succeed it. The fires to make this smoke should not be so near or powerful enough as to warm the trees or their immediate neighborhood. The intention is simply to shade the frozen buds from the too sudden change resulting from the rays of the morning sun. If the morning should be cloudy and the sun not be able to break through them until the day was well advanced, it is not believed that any human agency could improve the situation.

On the whole, from the writer's experience, and from all that he can learn, it is believed that, if in any situation, the thermometer does not fall below 16 deg. Fahrenheit during the winter, an abundant crop of this fruit is entirely within the means of any cultivator. Some of the writer's neighbors have resorted to bending down and burying their peach trees, and have succeeded thus in getting peaches each year when the thermometer has fallen even to 19 deg. below zero. It is important, however, that the several roots necessary to this operation, should be even more carefully covered than the tops, otherwise the disaster will happen as in the writer's experience, that as soon as the tree is uncovered and regains its perpendicular, a most abundant bloom is all that the over careful cultivator will gain for his trouble.

With regard to the more valuable apple, it may be said that in scarcely any part of Missouri will there be more than one-half of a crop raised this year. In both summer and fall apples there was a greater failure than in the winter varieties. Red June, Astrachan, Golden Sweeting and Early Harvest seem to have given the best results generally as summer apples. the Rambo, Maiden's Blush, Buckingham, Pensylvania Redstreak, Rome Beauty, again illustrated their superiority by giving some fruit where others in the fall gave none—while as to winter varieties, we may make honorable mention of the Winesap, the Raule's Janet, Ben Davis, Willow-twig, as giving some return for the care bestowed on them. There is but one orchard within the writer's knowledge where a full crop of the Raule's Janet has been gathered this year—that of Taylor Jones, of Ralls county, known as one of the most eminent agriculturists and pomologists of that section. His Janet trees for the past few years have given but modern returns, but this year they have given the most abundant crop he has ever gathered. Not believing in keeping the good things all to himself, he has invited all his friends and neighbors to come in and help themselves; and it may be recorded to the credit of human nature that few or none slighted the invitation. They carried them off by the wagon load, and all had plenty.

Time will not permit me to enter into other orchard fruits, nor do I consider them of any importance.

REPORTS OF THE TWO AD INTERIM COMMITTEES.

Mr. Wm. Stark, of Louisiana, Vice President, from the Ninth District, being also member of the Ad Interim Committee of the district north of the Missouri river, in the absence of the chairman of that committee, read the following:

REPORT OF AD INTERIM COMMITTEE FOR THE NORTHERN DISTRICT OF MISSOURI.

Mr. President, and Gentlemen of the Society:

The undersigned begs leave to offer for the consideration of this Society the following report on the progress of horticulture in this district. Learning that Prof. Swallow, the chairman of your committee, would not, on account of absence in the western Territories, be prepared to report, and depending on Mr. Vories, of the western border, to report on his portion of our district, I will confine my data mostly to my own locality, bordering on the Mississippi river, and that portion of the district drained by that stream and its tributaries.

Having been engaged and interested in the pursuits of horticulture from my earliest boyhood to the present time, and having been engaged for more than a quarter of a century in the nursery business here, in the county of Pike, I have had a fair opportunity, at least, to witness many of the difficulties with which our noble pursuit has had to contend—a few of which it may not be deemed out of place to briefly notice here.

Those who contemplated planting orchards for commercial purposes, were *sagely* told by croakers, and many well-meaning, though short-sighted, people, that they would have no market for their productions; that fruit-growing was certainly being greatly overdone; and many other similar statements were made, and arguments used which often deterred the new beginner.

These people could not fully realize the vast extent of our country, and the further all-important facts, that but a small portion of our country, comparatively speaking, could successfully produce in large quantities, and of fine quality, the most valuable fruits for commercial purposes. Others were deterred from planting orchards because, said they, we cannot afford to invest money and labor, so long before we get returns, forgetting that the increase in value of their lands, appropriated to orchards, well selected and well cared for, was greater than the increase of money at *compound interest*.

Another great drawback has been encountered by new beginners, in not knowing what to plant; and further, in not being able in many cases to obtain reliable articles, when they had made up their minds what they wanted.

Much too large a number of our selections have been made by consulting lists, good enough, perhaps, where made, but entirely unsuited in the localities, in the soils and climates where used.

In this way the value of many orchards has been greatly reduced.

And in connection with these various difficulties, I propose to glance hastily at the operations of another *pest*, which is fast obtaining vast proportions in the Western country—a pest which often proves disastrous to the experienced fruit grower. I mean the oily-tongued and dishonest tree-peddlers—the men who travel from house to house, and attack indiscriminately every one who has money to buy, or a place to plant a tree or vine, and even some who have neither.

These unprincipled characters use every means and argument their avocations has made them master of, to convince their too confiding, and generally inexperienced subjects, that they will furnish them exeactly what they need; but, as time too often proves, when too late to remedy the evil, fill their contracts with just what nobody wants. It is a well known fact, that this class of swindlers generally procure their supplies where they can buy the cheapest, regardless of quality or variety, all the while proposing to represent some responsible nursery as agent, partner or owner, in order the more easily and completely to gain the confidence of their intended dupes, and then dispose of their stock under all the popular names they find in demand. And, moreover, what often seems an unaccountable financial transaction, they usually sell their stuff at much higher prices than responsible nurserymen ask for much better articles. Under the operations of this system, trees are sold and bought, planted and raised, and when they should be worth ten dollars apiece, the unfortunate owner too often finds that he has drawn "the elephant," that his lands are encumbered with worthless trees, and acknowledges he would have been far better off had the "locusts or Egypt" or the devouring flames relieved him of his costly charge in their earlier days.

How much better for many such planters and the country at large if some honest and experienced horticulturist had said, at the right time and in the right place, "Beware of admitting into your confidence the oily-tongued tree peddler." No reference is had here to responsible agents and dealers who conduct a legitimate business, who have a local habitation, and who sell their articles for what they are.

THE SMALL FRUITS.

Almost all the small fruits, as far as fair experiments have gone, are known to do well in our district. The cultivation of these valuable and I may say indispensable fruits, is very considerably on the increase; and with the proper caution in the selection of varieties, and a reasonable amount of care in their cultivation, success is almost certain.

THE GRAPE.

The cultivation of the grape, the most valuable of the small fruits, is no longer regarded by anybody as an experiment here. The vineyards at Augusta, Bluffton, St. Joseph, and various other points on and near the Missouri river, and at Clarksville, Louisiana, Hannibal, and other localities on and near the Mississippi, may be regarded a perfect success. It is now a well established fact, patent to all who have observed and investigated the subject, that our district contains many thousands acres of land well adapted to the successful growth of all the hardier sorts of native grapes, and needs only a little more effort on the part of vineyardists, the application of a little more capital and skilled labor, to make it an important wine-producing district.

The portion of our district lying south of the Hannibal and St. Joseph railroad, as a whole, may be set down as better suited for vine culture than that lying north of said road. The grape crop this year proved in the main very satisfactory.

THE QUINCE, PEAR, PEACH AND APPLE.

The quince although cultivated in a very limited way, proves almost everywhere a complete success.

That delicious fruit, the pear, has, as a rule, been greatly neglected; but as far as the hardier varieties have been planted, in suitable locations, and been properly cared for, there has been but little, if any, just cause to complain of results. A few pear trees in rich garden spots, in manured or shaded localities, have been attacked by "the blight."

Some worthless seedlings and suckers have not borne fruit till they were twelve or fifteen years old. Thus the popular delusion has got hold of so many of our people, that the pear tree will not live in this country, and, if it does, we must wait half a lifetime for them to bear; when the fact is, the pear will produce fruit as soon as the apple; and nobody now doubts the expediency of planting apple trees, because they are so long coming into bearing.

The peach is not produced here, as a general rule, with quite so much certainty as with our neighbors, a little south of us. The past season, however, has proved an exception to this rule, for, while the crop this year has been most abundant throughout this entire district, it was badly thinned out by the late spring frosts in various localities, usually more favored than ours. But, as peach trees are so easily raised, and come so quickly into bearing, everybody who has room should plant trees, and be prepared for the good time coming. It is nowhere promised that they shall reap who fail to sow.

The apple crop of this year has been unusually poor. It has been a long time since our orchards on the Mississippi slope of this district have paid so little. The failure, I think, should not be attributed to any lone cause, but rather to an unfortunate combination of causes. The most prominent one, perhaps, was the great amount of rainy weather, together with the cold east and northeast winds that prevailed during so large a portion of April and May. This view is strengthened by the fact that, as far as I have had an opportunity to observe, those locations produced the most favorable results where the shelter on the east and northeast was most complete. I am also inclined to the opinion that many supposed fruit buds were imperfect, that the real germ was not fully developed, on account of the early and long continued drouth of last year. Although the buds had vitality sufficient to bloom out, close observation revealed the fact, plainly apparent at least, that a very large proportion of them bloomed only to "wither and die." There seemed to be so little vitality about them, that they would probably have proved worthless had the spring been ever so favorable. The knotty and defective apples also show that the moth and various other insect pests did a large share of work for us. The question very naturally arises, should this partial failure of the apple crop discourage either the man who contemplates planting a small orchard for the use of his family, or him who contemplates planting largely for market? Certainly not. We have certainly as few short crops or failures in this section of country as any other. No product is always sure to yield a heavy crop anywhere, and a failure of the apple crop is not so disastrous to the orchardist as the failure of agricultural crops is to the farmer, because the fruit grower bestows comparatively but little labor on his orchards in the seasons of failure.

The planting of orchards is rapidly on the increase, more trees having been planted during last fall and spring than in any other season.

The business of growing apples for market is yet but in its infancy in Missouri. It is not overrating this district to say that more than half of all the lands in it are easily susceptible of being made productive orchards, and that a very large proportion of them will produce, abundantly, apples which the world cannot surpass. With almost a boundless extent of country, both north and south of us, always for a market, and often elsewhere, it is, I think, a great mistake to waste our time in talking of over-production. For as the price goes down, the consumption increases. The price may go much lower than we generally get, and still, if we will produce largely, the business will pay well.

If the proper spirit is manifested along our various railroad lines and navigable rivers, in the planting and care of good commercial orchards, the time is not far distant when the return in money therefrom will exceed that of any other one production. And I feel confident, all things considered, that no branch of the whole agricultural and horticultural business of the country will be found to pay better.

Another important fact connected with the production of market apples, especially late varieties, is by many overlooked. They may be very profitably raised in connection with general farming, clashing with the business of that pursuit less, perhaps, than any other branch of horticulture.

REPORT OF THE AD INTERIM COMMITTEE OF SOUTHERN MISSOURI.—PREPARED BY T. W. GUY.

Your committee ad interim for the section of Missouri south of the Missouri river, respectfully report that, owing to the ill health of the chairman, and the business occupations of the other members of the committee, they have not been able to visit the different fruit districts, as it was expected they would, and as they themselves intended. We made but one trip, and of that, and of the observations of the member reporting, these few notes are respectfully submitted.

THE SEASONS.

This year may be noted as one of the extremes in our section of the State. Cold winds, late frosts, and the latter part of spring and early summer very wet, and then, in midsummer, drouth, with a very high degree of temperature. The winds and wet weather destroying the pollen and preventing impregnation naturally, and even artificially, by hindering the bees and insects in their work of gathering honey and roaming from flower to flower, bearing on their bodies the fertilizing powder so necessary to perfect the fruit. The late frosts killed some of the fruit in bloom, and so enfeebled a part of the rest as to cause it to drop and decay when the time came for it to form the seed or pit. Then, after these came the dry, hot weather of July, which prevented the proper swelling and growth of the fruit. After this, the hot weather, with frequent showers, caused the fruit, especially peaches and grapes, to suddenly swell to such an extent as to burst the skin, and cause the fruit to rot. It may be, these same causes will account, at least in some measure, for the disposition to rot and decay of our winter apples, of which we hear so much complaint.

THE APPLE.

The apple crop is an almost total failure, and on that account we have not given it that attention which its importance demands. Not seldom we have found the trees neglected, eaten up with borer, the ground uncultivated and grown to grass, and when cared for best we have found the apple-root aphis and the codling moth—for a description of which, and of the other insects we may mention, and of the best methods of preventing or destroying, we will refer you to the Committee on Entomology and our worthy friend Riley, the State Entomologist.

Of diseases of the tree and its fruit, we notice as more prevalent than others the so-called scab or mildew of the fruit. And here we find certain varieties more subject to attack than others, among which we may mention the Ortley, White Winter Pearmain, Newtown Pippin and the Red Astrachan. Our eastern friends have long suffered from this disease, which seems to follow and be caused by cold weather at and after the blossoming. For a preventive or cure, I confess I know not what to recommend, unless it be a thorough system of drainage and aeration of the soil, whereby we may elevate the temperature of the ground, and thus in some degree counteract the effects of the late spring frosts. Of the pear, plum and apricot, I am not able to speak at length, as I know of no orchards of these fruits that have yet come into bearing in our section of the State. Of the diseases of the pear, we wish to call special attention to a species of fungus, which, in our trip down the Iron Mountain Railroad, Dr. Hull, of the Illinois ad interim committee—who favored us with his presence, and to whom we are under many obligations—discovered attacking the roots of pear trees, and destroying the trees, in the orchard of Col. Bainbridge, of De Soto.

THE CHERRY.

The general impression seems to be that it is of no use to plant the sweet varieties of the cherry. We think this is a mistake, and that, by exercising proper care, some at least of the finer varieties, such as Bauman's May, Early Purple Guigne, May Duke, Elton, Black Tartarian, etc., might be successfully cultivated, especially in such soils as the southern part of St. Louis county, and along our river bluffs. Of the varieties generally cultivated, the Early May and Early Richmond, or

Kentish of Downing, are the most prominent. With this fruit, as with the apple, we have to report a failure, and owing, probably, to the same causes, aided and abetted by that especial pest of the fruit-grower, the curculio. Of diseases of this fruit, the rot seems the only one of importance we have to contend with, and this is generally prevalent only in a wet season. A more important hindrance to success are the birds, for which the shot-gun is the best remedy. Of the birds especially deserving the contents of the aforesaid shot-gun, we mention the cedar bird, oriole, cat bird and blue jay.

THE PEACH.

This fruit, we are glad to say, has not suffered to the extent of the preceding fruits, as sheltered locations and favored spots report partial crops. In my own neighborhood northeastern and eastern slopes, when planted in peach trees, had fair, and had it not been for the curculio, good crops of fruit, with exception of Hale's Early, a peach totally unworthy of further cultivation in my estimation, on account of its predisposition to rot, which seems inherent and constitutional, and has also its liability on account of its smooth skin to the attack of the little Turk. The favorite varieties with us in Jefferson county are Troth's Early, Yellow Rareripe, Old Mixon Free and Cling, Ward's Late, Wright's Mammoth, Heath Cling, so-called, but which we knew in Ohio as the True Heath, and a very large yellow freestone, raised, we believe, by Mr. Wright, of Hillsboro, in our county, and ripening about the time or little later than the Heath cling. Of insects, we have the borer, for which the knife is the surest remedy, and the above mentioned curculio, whose attentions to our fruits have been so persistent hitherto, but who, we are glad to announce, has at last found its match in the different species of cannibal insects discovered by Benj. D. Walsh, in his trip to Southern Illinois this summer, and described in the October number of the *American Entomologist*. Of diseases of the tree and fruit the above mentioned rot seems especially to attack varieties of a weak vitality as the serrate varieties, and other weak-growing kinds of early peaches. Peaches on trees that have been injured by the borer, or one lacking in health from being planted in wet soil, generally show a disposition to rot. And of hardy, strong growing kinds, the smooth-skinned, watery, soft varieties, such as Hale's Early, especially, are more or less subject to this disease.

Another disease, the yellows, was discovered by Dr. Hull during our trip down the Iron Mountain railroad. For this there is but one remedy, and that is to totally uproot and burn every tree infected.

Of the lessons we may learn from the experience of this season and comparison of former years we mention—

1st. It is of no use to plant the peach unless we expect to give it thorough cultivation and attention.

2d. That we should shorten in the wood in order to prevent the broken and ragged appearance which many of our orchards show after bearing a full crop, as well as to increase the size and beauty of the fruit. Because, by so doing we lessen the leverage and thereby enable the tree to bear up a heavier burden.

3d. We should bring into actual use the much praised but seldom practiced rule of thinning out our fruit, not so much to lessen the weight as to prevent the formation of seed to an excess. For we hold it as a fact that excessive reproduction destroys or impairs vitality, not only of the animal but also of the vegetable.

SMALL FRUITS.

The ever increasing production of the class of fruits called, for distinction, the small fruits, is still met by an increasing demand, so that, as yet, the market (not confined as formerly to our immediate neighborhood, but widened and enlarged by every new line of railroad or means of speedy transit) is partially supplied. We find the currant and gooseberry generally planted, but not to the extent their healthfulness and importance demand; and we believe that if due care be exercised to prevent the premature ripening of the wood of the currant, growing out of our summer drouths, by thorough trenching and mulching the ground, this fruit may be as successfully grown as in more northern climes.

The perquisites in the cultivation of the blackberry are a good, deep, rich soil, and high manuring. The distance apart it should be planted varies with different cultivators, but the most successful plantations we have seen were planted eight or ten by two or three feet and trained in the form of a hedge by pinching back the cane at the height of three or four feet, and developing the laterals, which in turn are cut back to the proper shape for fruiting.

The kinds of raspberries generally cultivated are of the Black Cap varieties, and Purple Cane. Philadelphia we hear highly spoken of by some.

Last but not least, we have that earliest of all our fruits, the delicious strawberry. Subject to few or no enemies in the shape of disease or insect, it is more grown and more profitable than any other of the small fruits. Yet we have not advanced beyond the Wilson's Albany, which, for productiveness, firmness, fair appearance and size, still heads the list. As to culture, it is not necessary for me to more than mention deep and thorough preparation of the ground and mulching as generally recommended by our best and most successful cultivators.

THE GRAPE.

In regard to this fruit we do not know that we can do more or better than to take the report of the vineyard of Isidor Bush & Son, which he has furnished us on request as a fair sample of the condition and prospects of grape culture in our section, merely remarking that we believe the remarks of Mr. Bush in regard to the report of the Secretary of the Alton Horticultural Society are nearer the truth than that the presence of iron in the soil is the cause of the rot he speaks of in the trip down the Iron Mountain railroad.

REPORT OF ISIDOR BUSH & SON—BUSHBERG VINEYARD AND ORCHARD.

Of the grape regions in this country there is probably none that excels Missouri in peculiar adaptedness for growing the grapevine; and in this State the county of Jefferson, with its high limestone bluffs overlooking the Mississippi river, and the ridge of hills next and parallel thereto, will soon occupy a foremost rank. When the U. S. Land Surveyors passed over its hilly, rough land, they classed them as "unfit for cultivation," and up to very recently its inhabitants thought them without value, except for their dense forest of oak and hickory, which they cut and sold as firewood.

Such a piece of land I bought four years ago, now known as Bushberg, at about $30 per acre, a price then deemed excessive notwithstanding its proximity to St. Louis, its possessing a station of the Iron Mountain railroad and an excellent steamboat landing, the Mississippi bordering it on the east. But my friend, Mr. Husmann, had examined the land for me, and on his judgment my son and I safely relied, as to its superior adaptability for grape and fruit culture. About the same time and soon afterwards several other of our well known horticulturists selected and purchased grounds in this vicinity, among them Messrs. C. Peabody, T. W. Guy, E. S. Foster, E. C. Sanderson, and others. But I must confine myself to a report of our own vineyards.

The heavier timber having been cut by our predecessor, the underbrush was very thick and grubbing difficult. We got four acres ready for planting in the spring of 1866, and off these we had a fine crop last fall (1868), especially of the Concord and Delaware, the first remarkable for the abundance, the latter for the excellence of its fruit, which brought us from 20 to 25 cents per pound, while Concords sold at 8½ to 10 cents. The quantity for wine was also very satisfactory on the Delaware, but birds and foxes destroyed a large portion; they are good judges of grapes and will scarcely touch Concord or Hartford as long as they find Delaware and European grapes on the same place. Hartford and Perkins were our earliest grapes, ripe on the 4th of August, and paid well. Creveling we did not have, as we planted them a year later; of about 250 Catawba vines we had a splendid first crop; we thinned out about one-half their bunches, and have never seen finer or better Catawbas, but from the experience of all grape-growers with the Catawba when older, and from the fact that the Catawba did this year extraordinary well at Hermann and other places west, where they usually suffer from mildew and rot, we would by no means take this one year of success as a promise that our location is one of the few where the Catawba will succeed well in future years.

Being located on the railroad, within one and a half hour's distance from St. Louis, and not sufficiently prepared to make wine on a larger scale, we marketed nearly all our grapes of the foregoing kinds; of some of the later varieties, however, namely, of the Herbemont and Cunningham, we made wine, of the quality of which we cannot judge as yet. Norton's Virginia, of which we had lost over one-half the plants during the first year, having received very poor plants, we layered the other half, and thus had no crop this year. The Taylor or Bullit proved with us, as elsewhere, a very poor bearer. It may improve with age, and we shall try its bearing qualities on two year old wood and spurs next year. The Clinton also produced too much wood to yield much fruit, and the so-called Rulander (or rather Ste. Genevieve), though very healthy in foliage, and blooming profusely, ripened but few fine bunches of small though excellent grapes.

Of all varieties which we planted during the first year, and of which we received fruit this the third year, none proved so highly satisfactory, as one of which we expected little, "Rogers' Hybrid No. 1." We counted as many as seventy medium sized bunches on one single vine, the size of the berries were very large, and their quality so fine that connoisseurs pronounced them equal to fine European table grapes. Mr. Husmann and others who saw them, said they had never seen that variety in such perfection before. To test its wine making qualities, we pressed a portion, and have obtained about ten gallons of must, promising to make a very delicate, fine flavored, white wine.

One acre we have prepared and set aside for a variety patch, to test new varieties and such kinds of which we do not know enough to warrant our planting a large quantity. We have now more than fifty American and a dozen European varieties there on trial, and hope to make it one of the most complete experimental vineyards, to visit which may, at some future day, be both useful and interesting to horticulturists; but at this date we would deem it premature to speak of our experience with those varieties.

We are extending our vineyards but very cautiously and gradually from year to year, and have now about nine acres planted, containing 2,500 Concord, 1,800 Norton's Virginia, 750 Herbemont, 250 Hartford, 600 Delaware, 500 Catawba, 300 Clinton, 250 Taylor, 100 Rogers' No. 1, 100 Perkins, 100 Cunningham, 100 Ives, 100 Maxatawny, 100 Creveling, 100 Alvey, 100 Rogers' No. 4, 150 Martha, 50 Rulander and 50 Cynthiana.

We have, so far, found neither rot nor mildew on any of our hardy American varieties just named, and believe that on our soil, wherever such diseases were found, on Concord, Delaware or even Rogers' No. 1 (as reported by the Honorable Secretary of the Alton Horticultural Society), it was the result of two close planting, injudicious late summer pruning and insufficient draining. The white fly, or so-called Thrips disfigured somewhat the foliage, but they fortunately appeared too late here to do damage to the fruit. The grape curculio was noticed in some berries of all varieties, though not very numerous now. It threatens to become a dangerous enemy to grape growers. The grape-vine borer (appearing to us quite similar and probably identical with the borer we find in the root of pear trees) has cut and entirely destroyed over twenty of our vines, which were, at the time, evidently perfectly healthy and laden with fruit.

We planted also a pear orchard in the fall of 1866, of about four acres, containing 500 standard and 1000 dwarf pear trees, all of which made a very fine growth, and appear perfectly healthy; not one was, so far, attacked by blight, but about a dozen were destroyed by the borer. About three acres we put in small fruit, of nearly all the best varieties. We do not venture as yet to plant largely of them, as pickers are more difficult to obtain, and our market for berries as well as small fruit plants, seems very limited. We look forward with confidence, however, to the time when the market for our fruit and plants will be greater than the supply; and while we find the expense of vineyards and orchards by far greater than generally estimated, we find also that they will pay a handsome return and interest on the investment.

CORRESPONDENCE.

The following letters from distinguished horticulturists were presented:

CLEVELAND, OHIO, November, 1868.

Charles Peabody, Esq., President Missouri State Horticultural Society:

Your courteous request that in case I could not be personally with you at the annual meeting of your society, I should write a few words is before me, and while I feel that I would much enjoy being in person present at your meeting to hear and learn from the knowledge of the many intelligent fruit growers now embraced in your State; yet as I cannot do so, you will please accept my thanks for your invitation to be with you in spirit, and by a few written words keep my many old friends in remembrance of me.

You invite from me "an essay on some horticultural theme," but as a production of that character involves both time and research, beyond my present control, in order to develop any new principle or elucidate any system of practice, you will please excuse me if, omitting the essay I transcribe a few notes of my observations on fruits, etc., which, after reading, I hope you will agree with me, may subserve the progress of horticulture as much as would an essay, recapitulating, only, in a varied form of words, principles and practices long known to the student of our art.

And first permit me to suggest to the members of the Missouri Horticultural Society, the necessity of some progress in the matter of exhibitions and premiums in fruits. Looking over premium lists for many past years, I fail to find any rule of progress. The amount of premiums has been increased, but rules of guidance toward designating the values of our soil or one man's growing, etc., over another have not been instituted sufficiently as I now view it to enable the spectator or the reader of a committee's report—to judge whereby one man shows fine specimens and at the same time another man fails almost entirely with the same variety. Again, in premium lists, award is made to the best number (five, seven, ten, etc.) of bunches or specimens of a sort, without regard to their having been gathered from one vine, one tree, or from a thousand. It is true there is a distinction between amateurs and professional growers—but at present only the amateur of wealth—or the large commercial grower can hope to win—there is no chance for the intelligent amateur of small extent of ground and with only one tree or vine of a sort. Nor is there any hope of reward for the young, energetic commercial grower, deficient in pecuniary capital.

As an instance of the failure to convey correct information by an exhibit and report, I will say that I have seen a plate of five bunches of Creveling grapes, all large, very compact, beautiful bunches, arrest the attention of every passing spectator, and be awarded and reported a prize by the committee. The spectator carrying home the name of the grape with his memory of its appearance, on reading the report of the committee is induced to buy and grow, but only to be disappointed by obtaining scattering, loose, and few bunches, when he expected to find the close, compact ones, which he originally saw, and which, if like myself, he had carefully inquired about he would have found had been selected from as many different vines, and each growing in connection with a Concord.

We may say perhaps that this man should have read the reports of the Missouri and other horticultural societies; but while condemning him for want of knowledge, do we not condemn ourselves for permitting the imposition?

I will not pretend to suggest even how this subject is to be remedied, but I submit it to the intelligence of your society, if a change marking progress is not needed. I will also add that I believe that the change must originate and be advocated by some intelligent body of horticulturists, in order ever to have those whose duty it is to prepare premium lists, give the subject attention.

Touching fruits, the past year has revealed to me nothing especially new in the line of practical culture. The only decided changes which I have noticed are embraced in a disposition to entirely neglect summer pruning of the grape and the cultivation of the earth among and around fruit trees. It may be that all the knowledge and skill in these practices during past centuries have been wasted, but I fear if we so regard it and take up the impression that nature and neglect are the best artists toward keeping trees and vines in an artificial position, healthy in foliage and productive of rich, delicious fruit, we shall soon be awakened to a realizing sense of our error by masses of foliage and no fruit on the vine, and by pear trees reminding us of the stub-tailed cows of New York.

Of new fruits, the past season has brought forth quite a number, giving more than average promise of value. Among raspberries, a yellow one originated by Charles Arnold, Paris, Ontario, Canada, has fruited, and gives promise of value when one of its color is desired. The mammoth Cluster has been pronounced as the largest and best of the black cap class; some, however, doubting its late origin and imagining it may yet be found an old variety under a new name. If it should prove so, I cannot believe that its present disseminators are aware of it. The Mrs. Wood—another allied to the black cap, but more like old red cane—promises of value for private gardens, but may not be firm enough for long transportation.

Of strawberries, I shall say nothing, for almost every town has a superior seedling of its own, and observation has taught me, that of all the fruits no one is less reliable in all soils and climates.

Among grapes, a seedling which I described last year as the "Hine," has again given fruit so good that I am induced to advise its trial by all interested. The Messrs. Ellwanger & Barry, of Rochester, N. Y., have a large number of seedlings, many of which I have examined; and referring to my notes and drawings I find them nearly all noted as possessing a "peculiar sprightliness," unlike most other native grapes, but only deserving of real merit as there grown, but as the climate of Missouri develops the grape to its greatest perfection, it appears to me no seedling maturing as late as Isabella can be decided upon as to value until it has been grown and ripened on your hills.

In apples, the only new one of real merit that I have had the pleasure of seeing is called "Manaen," and originated in Warren county, Pa., from seed of Talman Sweet. It is a light-colored, delicate, sweet, tender fleshed amateurs' fruit.

The subject of increased hardihood in the apple tree by means of using the Siberian crabs as one of the parents and crossing with some of the improved Russian varieties, has been agitated, and appears to me worthy the attention of fruit growers, and especially those who are growing seedlings looking to the originating of a new and valuable variety.

Of pears, Reeder's seedling, described last year by Charles Downing, fully sustains his description, and is one of the most delicious fruits of its class. In size a little above the Seckel, with all its sweetness and an increase of sprightly juice, slightly vinous and aromatic. Its maturing season is about one month later than Seckel. The Kelsey is a new seedling not yet set out. It originated in Columbus, O., is large in size, of a dull yellow-green, juicy, melting and rich—ripening in October and November, but has been kept until February. The tree is only a moderate grower, with close, firm grained wood and promises of value in rich, strong soils.

Trusting that what I have written may not weary reader and listener, I will close with a wish for the continuance and increased usefulness of the Missouri Horticultural Society and hearty "God speed you," to each and every one of its many intelligent members.

Respectfully, F. R. ELLIOTT.

NEW YORK, November, 1868.

Charles Peabody, President Missouri State Horticultural Society:

DEAR SIR:—I hope you will pardon me for not answering yours of the 5th instant at an earlier date.

I expected to have been able to write an article for your Society, but my correspondence is so extensive that I was unable to find the requisite time.

I would have been pleased to meet my friends at the West, and talk over horticultural matters, but we cannot always do as we wish.

I have often been in St. Louis, and am familiar with the country as it was fifteen years ago. But there has, no doubt, a great change taken place since that time.

I hope soon to get leisure to visit you and your Society, and become better acquainted with the men who are doing so much towards making the western States the garden of the world.

Hoping that you will pardon me for my neglect of your kind invitation, I remain,

Yours, truly, A. S. FULLER.

CONCORD, MASS., November 19, 1868.

Charles Peabody, Esq., President Missouri State Horticultural Society:

MY DEAR SIR: Your favor inviting me to your annual meeting found me under the hands of the Doctor. I hoped until within a day or two I might be able to accept your kind invitation, and fullfil a long cherished desire to see your western grape growing, and to make the acquaintance of those gentlemen who have done so much to promote the culture of the grape, and the making of pure wine.

I am deeply disappointed to find myself unable to come this season, but, if possible, I shall come next year, and will be greatly obliged to you if you will advise me what season is best to see your vineyards.

If my health had permitted me I would have gladly prepared a paper relating my experience in grape growing for the last thirty years, but my physician has interdicted writing—perhaps I may be able to do it at another time.

I have reached the fourth generation of seedlings, and have obtained grapes without pulp, delicate, high flavored, and a very great improvement over the Concord, both for the table and for wine.

I am very truly,
Your obedient servant,
E. W. BULL.

Adjourned to this evening at 7 o'clock.

WEDNESDAY EVENING.

Entomology being the order arranged for the attention of the society, the committee on Entomology submitted the following report:

Mr. President and Gentlemen of the Missouri State Horticultural Society:

The time was, in the history of this society, when we were dependent upon one another, more especially upon the members of the Committee on Entomology, for such information regarding insects, either beneficial or injurious to the fruit grower and farmer, as the seasons, in their ever-varied changes, had developed. That time has passed, and we hope it may never return. Not that the members of this society should cease to labor or observe—by no means; but, that we are dependent mainly upon our own meagre resources of observation and study for the information so necessary to our success as fruit culturists. We should all be better posted in Entomology than we are—if we were, or would be true to our own interests. A certain quantum of entomological knowledge is absolutely necessary to successful fruit culture, and I am happy to add, is now brought within the reach of every one. Missouri is the first among Western States that has a regularly appointed entomologist—though perhaps our Illinois friends will claim the honor for their own Prairie State. It is a good thing that these sister States can co-operate together—and with such enthusiastic devotees to science as Messrs. Walsh & Riley the field will be well explored.

It is not my purpose, in this paper, to more than refer in general to the peculiarities of the year 1868, entomologically considered; the details we hope to get in a full report from our State appointee. Allow me to remark, just here, that some very crude ideas prevail among men who should be better informed as to the powers or proper labors of a State entomologist. This official cannot (as some seem to think) by any magic art or incantation destroy, or tell us how to destroy, the millions of chinch-bugs, infesting our wheat fields; or the clouds of grasshoppers, which are eating up "every green thing," or the swarms of cicadas, destroying young orchards; or the curculios, which prove death to plums, peaches and nectarines; or the potato beetle, which blasts our hopes for the favorite esculent. "But," says one, "what is the use of a State entomologist if he can do none of those things!" *Cui bono*—what good does he do?

"An ounce of prevention is better than a pound of cure." Prevent, in its original sense, means to go before, or to come before; now, it is just in this sense that I wish to use this word in answer to the above question. If I rightly understand why such a scientist as an entomologist is appointed, it is this: He is to teach the farmer and the fruit grower how he may prevent the ravages of insects, or the destruction of his crops; how to distinguish between insect friend and insect foe; how to foster the one and destroy the other, before the latter has sufficiently developed to do damage. He is to show up any depredator of whose presence the casual observer can only judge by the damage he does; he is to make us familiar with the general appearance of insect foes or friends, in all their changes, and to inform us in what guise they do the most damage—for it is a well known fact that, while some, perhaps most, insects do damage in the larva state, like the codlin moth or the potato beetle—others like the grasshoppers or chinch bugs do most damage as perfect insects.

But, to return: The year just about to close has been entomologically conspicuous, as bringing forth the so-called seventeen-year cicada. They have done, and generally do, little damage, except if they happen to debouch from the earth in a young orchard or nursery; there they will do much injury by destroying the young twigs, into which the eggs for the next generation are deposited. That this same insect makes its appearance with us, *not* in seventeen, but in thirteen years, we think authentic records will establish; also this other fact, that, notwithstanding all *seeming* testimony, they do not sting, nor have we any proof positive that the incisions of their ovapositor is poisonous, or that it ever produced death.

Some sections of our State and the West have been infested by grasshoppers, which have done much damage; other sections have suffered from the ravages of the chinch-bug. *Certain* remedies to prevent the recurrence of these ravages are not yet known. Only this fact is to be noted—their appearance this season is no reason that they will reappear in the same place next year. Further, there is said to be a geographical line, which seems to be the limit of the eastward advance of the grasshoppers. The white grub (the larva of the common May beetle) has damaged crops in some sections. As far as their damage to meadows are concerned, my experience is, that the bulbous roots of the timothy will start again. As to the injury said to be done to some wheat fields, I think they will be found to be small. The worst pest, perhaps, that the horticulturist has to contend with is the curculio. I think if we had the proper data from which to deduce facts and figures, the damage done to fruit crops in 1868 would amount to millions. Plum, nectarine, apricot, cherry and peach—all fall before this omnivorous "little Turk;" while even apples and pears are greatly damaged thereby. But we have learned something about heading him off, and any one who proposes to himself to live by fruit raising, must be a thoroughly scientific cultivator; or, in other words, he must have the requisite knowledge and experience, without which success cannot be achieved.

But, Mr. President, we are to have a full and elaborate report from my enthusiastic friend, Mr. Riley, one every way qualified to instruct and entertain this association upon the subject of entomology.

I stated in the outset that we are not now so much dependent for information upon the Committee on Entomology (the chairmanship of which committee has been intrusted to your humble servant), and I hope that this report, thus briefly offered, may be received as an introductory merely, to the report of our State Entomologist.

All of which is respectfully submitted.

CHAS. W. MURTFELDT,
Chairman of Committee on Entomology.

Mr. C. V. Riley, State Entomologist, read an elaborate and valuable paper upon the cicada, or seventeen-year locust, as it is called; giving its history, habits and chronology, dispelling superstitious notions in regard to it, etc. It will be found in another part of this volume. The paper elicited the following discussion:

Mr. Trabue stated that a case occurred in Ralls county. Some locusts got into a bucket of water and were drowned; four of the workmen wanted water; three refused this, and one drank, and was immediately taken very sick, and it was for a time thought he would die.

Mr. Riley did not think there was any connection between the locusts being in the water and the violent sickness of the man. They are fed upon by many other animals without any injury. People are apt to make deductions without proper care.

N. J. Colman thought the sickness might be caused by imagination.

Mr. Riley—Would like to have any facts that are known in reference to the subject of this paper.

THE CURCULIO.

N. J. Colman—Would like some information in regard to the curculio. It is becoming so very destructive; we must know what to do with it.

Mr. Riley—About the curculio, each has his own opinion, even yet there is much room for discussion. The best authorities disagree on some points. It goes into the ground at different times; they being in different stages during the summer. In winter the perfect insect hides under leaves and rubbish, and comes out in summer. It is a good plan to burn the rubbish around the orchard in winter. Where the orchards are near the timber, it is hard to get rid of them; it might be well to burn up the rubbish and young growth there. Sheets are about as good as Dr. Hull's Curculio-catcher. It certainly hibernates above ground during the winter.

Wm. Stark—Will plowing the trash under help them?

Mr. Riley—I don't think that would affect the beetle at all. I have known them creep out a foot through the earth.

C. W. Murtfeldt—I was down at Cobden, and heard Dr. Hull say it would be 25,000 years before they could get a sound peach crop. He says when the stung peaches dry out the larva drops from the tree. It is a fact that Dr. Hull is almost entirely exempt from the curculio. The Doctor thinks that the peaches that fall and remain on the ground will keep up a full supply.

Mr. Riley—It is hard to generalize on this. I have known them stay in the peach after it had dried up. I think Dr. Hull's statement, that they would have no fruit in Southern Illinois, unwise. They are apt to have fruit next year where they had none this, from the insects having had no food.

O. H. P. Lear—In regard to the worms in the peaches: The worms are found, to some extent, in all decayed fruit. Are there not other insects in the fruit besides the worm of the curculio.

Mr. Riley—There are two different insects; one that undergoes its transformations in the peach.

Mr. Lear—I found them in the peach several years ago. I have found the perfect insect in the wild plum. I sent some samples to Mr. Sanders, in St. Louis.

Dr. Spalding—I don't think that Dr. Hull said that all the larvæ dropped, but that a sufficiency of them dropped upon the ground to keep up the breed. There are two new insects that may prove to be serious enemies; they prey upon the pear as the codling moth does upon the apple. The larva is only half an inch long.

They not only puncture a pear and destroy it, but they destroy several pears, puncturing them so that the juice runs out. They are yet but few, but are increasing.

I find them in all the States and in almost every orchard.

In the east many parties had noticed their effects, but had not traced the cause. There is also a large "borer" found more or less in the vineyards of Missouri. Mr. Husmann saw it some 8 years ago. Mr. Chambers saw it at Webster 7 years ago. I have found several. This year found 10 or 12 in among my Norton's Virginia vines.

It bores in the root. If it works 10 or 12 inches down, the vine may live, but if high up, it kills the vine. The first intimation is the leaves turn yellow and the vine dies. The worm is about as thick as the finger.

N. J. Colman.—This larva does not destroy the grape vine alone. It has been sent to me from several trees, especially the apple tree.

Mr. Stewart.—I have found them working upon apple trees, and more especially in new prairie land. They are always working down, never found him with his head up. Have lost thousands of seedlings by them.

Mr. Riley.—This worm that is in the grape attacks the apple and Osage orange. It is produced in other trees. I think it is in many old trees. There is another Curculio attacking the pear, and there are some attacking the pip. Other insects are on the increase, but our knowledge is getting the better of them. I feel that they can be checked.

I wish to hear from those present if the Bark-louse is in this State. If it does not exist it never will. In the northern portion it may exist, but by care in buying trees from infested regions it can be prevented.

In the central and southern portion it does not exist. This fact is worth million of dollars to the State. If it once gets hold on a single tree it is almost sure to destroy the whole orchard.

Dr. Morse.—I did have the Bark-louse from trees got from Pike county, Illinois. They seemed to die in about two years.

Dr. Edwards.—I have heard that a wash prepared from coal tar will kill the curculio.

Mr. Riley.—This is not so. He will run his nose into this, it is so with coal tar. It is generally that the larva gets full fed all ready to wind up, and the wash happens to be applied, and because the larva disappears it is thought he is destroyed.

I think that time is the only thing that has any effect on the curculio. Coal tar will not, and Cresylic acid will injure the tree in the crude state.

Mr. Lear.—Eighteen or twenty years ago one of the first trees I set out was killed by the Bark-louse. It was a white starlike scale. I found some other trees affected and took soapsuds and lye and scrubbed the trees, have seen none since. There were a few about the trees sometimes in other gardens.

I find in some of my trees a white soft insect that floats in the air, at the roots it forms a callous. One tree suffered much from this. I cut all the knots off and it is now one of my healthiest trees.

Mr. Riley.—You may thank a little fly for this. I can tell where this *aphis* is, and it deposits its eggs in the substance of the insect which destroys its life.

Adjourned till to-morrow morning 9 o'clock.

THURSDAY MORNING.

The society convened in the Chapel of the University at 9 o'clock. Prayer by Dr. Read.

After some preliminaries, the order of the day, viz: an essay on Landscape Gardening by M. G. Kern, of St. Louis, was taken up. In the absence of the author, the essay was read by Col. N. J. Colman, of St. Louis.

ESSAY ON LANDSCAPE GARDENING.

Ornamental gardening, the art and practice of improving and beautifying grounds, has been governed, throughout the course of its history, by two distinct ideas. Its primitive principle prevailing over centuries of slowly progressing civilization, was that of artificiality.

To make its productions distinctly unlike those of nature, was the fundamental effort of all ancient styles of gardening. The Italian, the Dutch and French styles, in their days the fashion of the world, copied wherever wealth and power reared palatial mansions, are successive modifications only of the all pervading notion, to set aside the forms of nature, and to produce in their stead features—artificial, grotesque, and dictated purely by imagination. The freedom loving tree, shorn of its graceful boughs and forms, was made to represent a stone wall, haystack or a peacock.

Designs made up of ever repeating, regular and geometrical patterns, could not fail to produce that splendid monotony, for which the ancient gardens are so famous. Advancing civilization and refinement, more fully comprehending nature as the source of real beauty, began to strive for it, instead of arbitrary fancy. And this desire called forth that new progressive dispensation, which we call the landscape style, or landscape gardening.

It is not my intention to present this subject as a science, come to us from abroad; nor do I wish to point the Western farmer to the famed parks and gardens of Europe or the Eastern States, upon which streams of treasure have been lavished. To refer him only to the charming scenery of our Western country; and to point out the elements of beauty transferred from nature to our grounds, is the object of these pages.

It may not be unprofitable to glance at first, though hastily, over the many so-called ornamental grounds, which surround the happy country houses of our land. Are not most of them a confused mass of trees and shrubs and flowers, planted, as it were, to suit the sheerest fancy of the owner? Such grounds, when neatly kept, may be very pleasant to the eye. Their verdant lawns and shady groves, invite our praise and admiration, but landscape gardening—the art to make a scene resembling nature—has no relation to man's confused mass of shade and foliage.

The element of beauty, of which the endless variety of nature's scenery is composed, form the broad and lasting platform upon which the art of landscape gardening has been built. To analyse these elements, in their manifold connections to each other, and to distinguish them from many defects found in outward scenery, should be the study of the improver. To produce features essentially beautiful and true to nature; and to suit them with good sense or judgment to the greatest degree of utility for our grounds, this is what we call good taste in landscape gardening.

Let us examine a fine landscape, seen from a certain distance, either in nature or on canvas.—What is it which lends to it attraction, or produces that emotion, which you call its beauty? This landscape is a group of objects, harmoniously united and combined, and blended by a proper balance of light and shade, and of form and color. Take away this genial harmony, or the pleasing contrasts, and all the beauty has departed. Ignore in gardening this fundamental principle of harmony and of contrast, and you produce nought but confusion.

And here you have the key-note to a rational system of grouping, without which no picture can be imagined. You divide the light from the shade by a due proportion of lawn and wood.—You contrast one group from its neighbor by the tint of its foliage, by the outline of its boughs, or by the colors of the flowers.

In this way is it that landscape gardening produces variety. How different, indeed, is such variety from the all-prevailing, hap-hazard mixture which makes up our grounds at the present.

To mention another sad abuse of landscape gardening in this connection, let us look at the figures, forms and outlines seen in many gardens. Is it in the shape of a heart, a pear, a star, or the half moon, that the beautiful groups of nature stand up in bold relief? Are not such ridiculous jimcracks almost universally admired and freely copied, mistaken for most excellent taste by many whose sense of true taste should be better?

Contrast with such absurdities the graceful forms, the flowing outline, the native liberty of a thousand groups and masses, sprung up in the woodland or the prairie, on the hillsides or in the valleys—forms harmonious and contrasted, in bolder masses here, in lighter linings there. To create a scene resembling nature, this endless line of beauty must be imitated. With varied outlines and the proper blending of form and color well applied, your work will nigh resemble nature's patterns.

Intimately connected with the laws of natural planting, is the consideration of the conformation of the ground, upon which you operate. The shaping of its surface is of the utmost importance in the arrangement of scenery—in the same ratio indeed as the surface of a country conditions the character of its scenery. As a rolling country is more pleasant to the eye than a flat and monotonous plain, so will pleasing undulations of the lawns be more productive of beauty in our grounds. Wherever this transformation from the level to the gently rolling can be attained, without too large an expense of moving of ground, it should not be left undone.

We have said above that the surface of the ground conditions the entire character of scenery. Upon this axiom landscape gardening has divided the gently undulating, with its corresponding character of grace and roundness in its groupings, from the boldly broken and spirited formations, knowing the one as the beautiful or graceful, the other as picturesque scenery. These distinct characteristics should always be adhered to. A pernicious mixing of the one with the other will ever produce a marring discord, detected at the first glance. To place a bit of the picturesque, say a piece of rock-work, upon a smooth and dressed lawn, before your very front door, as it is often seen, is ridiculous in the extreme.

And this same consideration of the external fitness of things must prevail throughout. If you introduce water in your picture, you must place it on the lowest ground, and shun all idea of the stiffness of a straight canal or a round and artificial pool.

Operating with rock-work you should alway place it where it might have sprung up on its own account in nature. Each feature must have its precedent in nature. Devoid of this, it becomes an utter absurdity.

With the same rule of common sense, you should treat all considerations of comfort and convenience, so essential to your permanent abiding place. A road or walk is a necessity, and not a component indispensable to scenery. It should therefore, clad in graceful lines, appear a helpmate and not a contradiction. Its object should be plainly seen, its graceful curve or winding bend, must appear a matter of necessity rather than of choice. The shape of the ground and groups along its line must explain and reconcile its course. An apparently useless or a vainly twisted road though often met with, is always an indication of very doubtful taste, and lack of common sense.

Sound judgment also will guide you in the choice of the scale on which improvement should be made. It will not allow you to attempt an elaborate or complicated design in miniature, on a spot where natural plainness would be very pleasing.

Whatever could not grow and thrive in nature on a given spot, should also not appear as forced and cramped into our grounds.

Let us illustrate this rational choice of scale, and its proper adaptation, by some examples found in outward scenery.

In your rambles through the fields and forests, you come to group or thicket, whose exquisite beauty excites your admiration. Though small in extent, its blooming outlines are full of charms of native freedom. You admire it with a silent wish to take it up and to transplant it whole and undisturbed into your garden, as its size would fully suit your yard, cut up at present by petty walks and fancy flower beds. 'Here is an offering which rational landscape gardening has for you. Accept of it, and you will have a thing of nature's beauty well applied. You choose the choicest shrubs and flowers for its formation, and these will make your group far more inviting than the original which you admired in the woods.

A shady cluster of lofty forest trees will also teach you how to protect the homestead from the sun and wind. Plant such a cluster in your yard, and shortly you will acknowledge that groves are very pleasant and much finer than your neighbors' scattered trees.

To present another example, let me point you to one of the many beautiful wood-embowered gentle elevations, those gems of prairie scenery, as they run along and join on to the timber lands. Feeble words indeed cannot describe the smiling, graceful beauty of such a scene. The wish to build your home, to rear your children and to spend your days on such a spot, could surely not be called a wicked thought; and why not make your dwelling place just such a favorite, charming spot? A slight acquaintance with the ways of landscape gardening will teach you how to beautify your dear prairie home, in native prairie style. We do not advise you to copy from a millionaire's pleasure ground, but from the most inviting scenes which you can study from your very door.

But what of the untold, sunburnt, wind afflicted towns and houses looming up on all sides on our treeless prairies? Has progressive horticulture no advice for them to offer but orchards, apples, grapes or pears? The rising generation will eat your fruit, but will demand besides a modest amount of landscape gardening.

But from the bleak and open prairies, let us enter the thick and gloomy forest, which yet covers untold acres of our State. A weary tramp may bring us to a spot where we can see the sun again. And what a scene of beauty is such an opening in the woods. A truly splendid lawn, surrounded by majestic masses of lofty trees, and spreading shrubs, distinct in outline and in foliage, and bordered as it were, by a wooded landscape in the far-off distance. And here one word to the dweller in the woods. Your home, a cottage, or a mansion, should be surrounded with just such a timbered lawn. All elements of beauty are in your forests, awaiting only your skillful axe, to develop them into a picture. Select your openings, and your distinct leading groups and masses, in graceful and intricate contours; you save a cluster here, and there a pleasant thicket, to which you add the various rarer trees and shrubs you wish to plant. How many charming pleasure grounds could landscape gardening, rightly understood, bring forth, with but a small additional expense. But nowhere is nature's kindest gift of beauty, or the voice of common sense, more sadly and ignobly murdered, than in the clearing and destruction of our woods. A lamentable practice of planless cutting down, or uniform and tasteless thinning out, has ruined the charm of many a beautiful forest home. And when the job of destruction is completed, you see the sham improver setting out his ragged locusts, evergreens and some flowering bushes, hap-hazard as his whim and fancy may dictate. Is this intelligent horticulture, or what shall we call it?

Horticulture has been called the poetry of agriculture. What is it that should make it so? We will cheerfully grant a little more poetry to a ruby strawberry than to a potato, or a higher and loftier meaning to a barrel of fiery wine, than to a pile of corn, however large. But if the aim and ultimatum of horticulture are only the production of fruit and wine (which is nothing but food,) then it may as well divide the honor of its poetry with agriculture at large. To be of higher order it must yield enjoyment to the mind, dropping wreaths of beauty all along its path. Realising this distinction, man has taken the lovely flower from its native and retired spot and placed it before his door, knowing that "a thing of beauty is a joy forever." This impulse for the beautiful has been the cradle of floriculture and of ornamental gardening generally. And has not this branch of horticulture ever closely followed the onward march of mind, of civilzation and refinement? And will the intelligent and educated horticulturist of the West pretend that ornamental gardening will not pay? I trust that every one will offer cheerfully his helping hand to foster and to encourage the noble cause of showing beauty, comfort and refinement broadcast around our Western homes.' And our horticultural societies, though overpowered at present by the rage for fruits and manufactured wines, will they not lead the column of progress and improvement alike in all the various branches of the charge intrusted to their fostering care.

We have the promise that the earth shall bloom again like Eden. To hasten its fulfillment, let every one begin at home to regenerate his own dominion and let him strive to re-enthrone the ideal of beauty which nature has scattered so bountifully throughout our land.

A few remarks were made upon landscape gardening, immediately after the reading of the Essay, as follows:

Mr. Colman—I think that this Society, and others of the same class have been neglecting the subject of this Essay. We should give it a much more important place in our deliberations than we do. We had hoped that Mr. Kern would have been here, to give an opinion about setting out these grounds. Columbia has some of the finest sites for buildings that are in the State. We should be missionaries in the higher branches of horticulture, as well as in fruit culture.

Mr. Spalding—I am afraid we have not sufficient time or information on this subject. The grand difficulty in planting is to know the form and habits of growth of the trees. I wish to call attention to a work by F. R. Elliott, on ornamental planting and trees.

The following Essay was then read by John H. Tice.

Before I read the essay prepared for the occasion, I will state how I came to prepare it. A few weeks ago I met our President, who said that he wished I would undertake to prepare an essay on some subject connected with horticulture, and treat it from a scientific point of view. I informed him I had not thought of any such, and could not then say whether I would or would not comply with his request, but would, in due time, inform him of my determination.

Being thus left free in my choice of subjects, I thought that no subject could interest you more than that of modification of climate, and the means by which it can be effected. The progress of civilization starts many problems for solution, moral, social, religious and physical. With only physical problems can we, as horticulturists, deal. The extreme abnormal condition of climate, brought about mainly by the agency of man, will soon force upon us for solution the problem of climatic modification. A great portion of the earth's surface, both within the torrid and temperate zones, is now uninhabitable by man. While the human race, thus far, may have found ample room for habitation, yet its numbers are now multiplying with greater rapidity than ever. And soon it will want room to spread itself over the sandy plains of the west, the arid plains of Asia, and even the Great Sahara of Africa. War, pestilence and famine, the dire foes of humanity in former ages, have been mitigated by the progress of civilization, of medical science and commerce. Infants, not even feeble ones, are no longer exposed to wild beasts, or abandoned to perish by the elements as in barbarous times, but for the outcasts, the foundlings and the orphans, civilization erects hospitals, furnished with all the comforts of life. The general external conditions of the race have been ameliorated, so as to contribute to health and constitutional vigor. The consequences are a rapid increase, which will soon want room, and must find it in now inhospitable deserts. The question of climatic modification, then, is a question of the expansion of the human race; and this latter, again, a question of man's ability to transform the cheerless, cold Steppes of Siberia, and the burning, sandy deserts of Asia and Africa into genial habitations for man. The essay is an endeavor to answer the last question affirmatively.

HUMAN AGENCY CAN EFFECT CLIMATIC MODIFICATIONS.

BY J. H. TICE.

Man's mental constitution is such that the first ideas he acquires are of the sensuous world. Hence, he ascribes all the physical agencies and the phenomena that he sees around him, to a sensuous, materialistic origin. What is true of man, individually, is true of the race. Hence, the origin of the materialism that marks the earliest religions and philosophies, and the long ages it required to develop spiritualism. What is singular, spiritualism owes its progress more to those who dealt with matter and the material facts of the universe, than to those who had especially in charge mental, moral and spiritual concerns. Even now, theologians, who have not kept pace with the scientific discoveries and mental progress of the age, stand aghast at the boldness, earnestness and intensity of the free inquiry which characterizes the present age, and predict that it will end in universal materialism and atheism. Be not alarmed, for the reverse is true. That earnest desire to know, which sways the present generation, which summons to its bar all orders of dogmas to give an account of themselves, why they are here, and what they are doing here; which interrogates nature, and accepting no denial, wrings from her secrets withheld from the beginning, is getting responses that turn man from the material toward the abstract, the ideal, the spiritual.

What emancipated astronomy from the gross materialistic idea of the ancients, that the heavenly bodies were supported and carried around in their courses by revolving crystaline spheres to which they were attached? What has freed it from the Ptolemaic complex and mobile machinery of epicycles; or from the etherial currents and vortices of Descartes? It was free inquiry, which, under the lead of Newton, struck away these crude devices, and substituted the action of a universal immaterial force.

When we consider the vast field comprehended under astronomic science, we must acknowledge that the demonstration that invisible and supersensuous laws govern the universe, instead of material contrivances, was the greatest triumph that science ever achieved for spiritualism, giving for the foundation of the universe a pure, immaterial principle.

Towards the close of the last century, the human mind reached the great principle of the indestructibility of matter. What is strange, it accomplished it by a material implement, the balance of Lavoisier. Before that, if in his manipulations and processes, a portion of matter disappeared, the chemist had this ready explanation, it was destroyed. So long as it was admitted that matter might be destroyed or wasted, great chemical progress was impossible. But Lavoisier's chemical scale-pan demonstrated that though matter changes with protean facility, traversing a thousand cycles of change, vanishing and reappearing incessantly, yet it never wears out or lapses into nothing; no atom is ever created or destroyed. When, therefore, the chemist was under the necessity of starting with the axiom that matter is indestructible, he was compelled to account, in his result, for every thousandth part of a grain of it with which he commenced. Under this inexorable condition, he had to improve his methods and manipulations till the exaction was satisfied. The result was rapid development of analytic chemistry, and placing it upon that advanced and exalted position it now occupies.

Again, if we take heat and examine the former theories concerning it, the same law of advance from materialism towards spiritualism is manifest. The old hypothesis was, that heat was latent matter, a subtle fluid, phlogiston, which inter-penetrated all substances. The great chemist, Lavoisier, with his balance, demonstrated that heating bodies did not increase their weight; therefore, the phlogistic hypothesis of an invisible fluid or latent matter was a delusion. But, unable to free himself from the old notion of materiality, he called heat an imponderable element, to which he gave the name of caloric.

Benjamin Thompson, better known as Count Rumford, a native of Woburn, Massachusetts, has the honor of demonstrating the fallacy of the caloric theory, and of all others based upon the materiality of heat, and of announcing the true and now accepted theory, that heat is a *mode of motion*.

In a paper contributed to the Royal Society of London, and published in its Transactions for 1798, he describes his experiments in evolving heat by rubbing two metalic surfaces together, which he says, "gave off a constant stream of heat in all directions, and without any signs of *diminution* and *exhaustion*." He further states: "In reasoning upon this subject, we must not forget *that most remarkable circumstance*, that the source of heat generated by friction, in these experiments, appears evidently inexhaustible. It is hardly necessary to add, that anything which insulated bodies can continue to furnish *without limitation*, cannot possibly be a *material substance*. And it appears to me to be extremely difficult, if not impossible, to form any distinct idea of anything capable of being excited and communicated in these experiments, except it be MOTION."

In the same paper, amongst other experiments performed by him, he describes how he made water to boil in a wooden box surrounding an iron cylinder, in which a plunger under a pressure of 10,000 pounds, was made to revolve at the rate of 32 revolutions per minute. In 2½ hours the water in the box boiled. The facts stated by Rumford, and the inference deduced, by an inexorable logic, from them, "that anything which insulated bodies can furnish without limitation, cannot possibly be a material substance," was fatal to the caloric theory. Rumford considered it so; and therefore, with a boldness and penetration characteristic of true genius, he substituted the now accepted theory; that in the production of the evolved heat, it was impossible to conceive that anything had been communicated, except MOTION. Modern scientists, it is true, express the same idea in a different formula; "heat is a mode of motion;" that is, motion is a *genius* of which heat is one of the *species*. But this does not rob him of the honor of its discovery; for he evidently understood the whole problem proposed, and the sufficiency of his solution. Having used horse-power to produce the motion employed by him, he says, "Heat may thus be produced merely by the strength of a horse, and, in case of necessity, this might be used for cooking victuals. But this method of producing heat cannot be advantageous, for more heat might be produced by using the fodder necessary for the support of the horse as fuel." That is, the fodder, if burned, would produce an amount of heat equivalent to that evolved, less the amount lost by friction of other parts of the machinery and the animal heat evolved and lost while performing the work; which squares exactly with the now accepted theory.

As it was with heat, so it was with the other dynamic forces, light, electricity, magnetism and chemical affinity. Each was supposed to be an invisible, subtile, interpenetrating fluid. Lavoisier's chemical scale-pan showed they all lacked ponderosity, an essential property of matter; they were, therefore, placed with heat, as "imponderable elements." But their materiality remained unquestioned. Science has now demonstrated that they all are purely immaterial, cosmical forces.

It has already been stated, that, only at the beginning of the present century, did the human mind attain to the great physical truth, that matter is indestructible. It was more than a half century later before it attained to the still greater truth, the underlying principle of all being, the indestructibility of cosmical forces; and consequently of all forces of whatever nature or origin. The phenomena, indeed, by which they manifest themselves in various forms to our senses, perish; but they live in all their original potency in their effects.

To explain: motion is lost, that is, it has expended itself on some substance. It has ceased to exist as motion; but the substance that arrested the motion, has been heat, perhaps, electrified or magnetized; and consequently, has had its structure more or less changed. In short, it is no longer the same identical substance, in its properties, as before. If we take the now heated body, we can with its heat reproduce motion; or, we can produce an electric, or magnetic current, chemical combinations, etc. With electricity, we can produce motion, light, heat, magnetism and chemical combinations. And so of all forces. We find each reverts and is lost in its genius, motion. Hence science calls them all modes of motion; that is, motion is the genus, and heat, light, electricity, magnetism and chemical affinity are the species. Each correlates mediately or immediately to motion that produced it, and is its equivalent.

All nature, therefore, is a store-house of forces. Besides those already enumerated, there are gravity, attraction and cohesion; some emanating from lunar, solar, sidereal, or other cosmical sources, inhering in organic and inorganic bodies, yet everywhere, they are equivalent to the energy expended in storing them up. By gravitation the rain falls to the earth, and the rivers flow to the sea, yet the power of gravitation in both cases, is but equivalent to the force of solar heat which raised the vapor to the upper atmosphere. Hence, there is not only a correlation and equivalence, but a conservation of forces.

It is only necessary briefly to state how largely man avails himself of these forces, but it would be presumptuous to mark the limits to the extent, or predict how much farther he will avail himself of them in the great future, now looming up so gorgeously before us. That power which puts man in instant communication with the remotest parts of the globe, and almost endows him with ubiquity, lies inert in an acid and a metal until it is liberated by electric action caused by juxtaposition. The flying car that outstrips the wind, is driven by a liberated force derived from the sun and stored up in a rank vegetation, now converted into coal, millions of years before the earth was a fit habitation for man. The water power that turns our mills, grinds corn, spins cotton and wool, weaves cloth, and manufactures the necessaries and luxuries of life, is the equivalent of solar power exerted thousands of miles distant, generating heat to evaporate water and currents of air to float the vapor over these distant shores for our accommodation. Nay, further, every thought that springs up in the active brain of man, every emotion productive of pleasure, or pain, and every muscular movement in living animals, is an expenditure of power derived from the sun and stored up in the food consumed.

But though it is true that all the movements of animated nature, and the mechanical contrivances of man are produced by the liberated forces stored up and conserved from former epochs, yet we can never evoke from the inexhaustible magazine of nature any force exceeding the energy exerted in its composition. Nor can we obtain a force exceeding the power employed in its liberation. One always is the equivalent of the other. Were it otherwise, and we could create force, that is, obtain an increment over and above that expended in its liberation, then we could produce perpetual motion. But since we can no more create force than we can matter, therefore, the invention of perpetual motion must forever remain in abeyance.

We are now prepared to proceed to a demonstration of the proposition stated in the beginning. "Human agency can effect climatic modification."

From what has already been said, it is evident that if we have motion we can get heat. Moreover, since the heat obtained will be the equivalent of it consumed in the production of motion, the quantity of heat we can command, must depend upon the momentum of the body in motion we are dealing with.

It, therefore, occurs to everybody that we have such a source of heat in the winds that sweep over the earth's surface. Atmospheric currents are produced by solar heat warming unequally certain portions of the earth's surface and the superincumbent atmosphere. Being specifically lighter, the warmed atmosphere rises, and the surrounding colder air rushes in and supplies the place. Strong winds as far remote as the poles, are produced by the heating of the air under the Equator. Remote as these currents are from the seat of the disturbance that causes them, yet, if it were possible to completely arrest them, they would evolve an amount of heat equivalent to that consumed in producing the disturbance.

It is well known that our treeless prairies are almost uninhabitable in the winter, while the adjacent forests have a climate so moderated as to be quite comfortable. Moreover, it is also known that great modifications in climate are experienced, as settlements extend, trees are planted, and forests spring up. Those living in a timbered country also know how much colder it is in the open fields than in the timber. Even dumb animals know this, and when a cold winter storm encounters them in the open fields they fly to the timber for shelter. What is the explanation of these facts? An explanation has been attempted by stating that evaporation from the body is so much greater in wind than in a quiet atmosphere. As far as evaporation contributes to this difference, it can only affect our feelings. We, however, cannot judge of the degree of cold by our feelings, but by the indications of the thermometer. It is not affected by evaporation unless its bulb be moistened, yet it also indicates a great difference between the two localities. Some other explanation than the evaporation theory must then be sought.

The thermometer indicates the true difference between the temperature of the open and sheltered locality, says another, but this difference is not owing to the heat evolved by arresting atmospheric motion, but to the compression of the atmosphere against which motion expends itself, for it is a well established principle that if force enough is employed to compress a body, heat is evolved. To this theory it would be a sufficient answer to state that motion does not expend itself in dashing against a stationary atmosphere, but against the forest. The atmosphere, before the storm commences, is stationary in the open plain as well as in the forest, yet we find it is so exceedingly mobile as soon to move away with the storm, therefore, but little compression can take place, and consequently but a small amount of heat evolved. It is, however, true that stationary atmosphere being struck by a storm will to a limited degree be compressed, and to that extent will evolve heat. It is also true that in this case nothing would be gained, for the same amount of heat evolved by compression would be reabsorbed when the atmosphere resumed its former tension. This evolution and reabsorbtion of heat, to explain anything, must produce an oscillation in the thermometer, indicating warm when the quiet atmosphere is first struck by the storm, and cold when the compression is over. But there is no such an indication. The thermometer obstinately maintains a difference in temperature between the exposed and sheltered localities. The heat evolved by compression is therefore so infinitely small as not to be measurable by the thermometer when either evolved or reabsorbed. But admitting it were measurable, then by subtracting it, there would still be a large residuum not accounted for. This residuum can only be accounted for by the arrestation of motion in atmospheric currents.

Thus nature, that wisest of all instructors, teaches both the highly endowed creature man, and the irrational dumb animals, by pointing out to them localities where the fury of the raging elements are assuaged, and indicates the conditions of their mitigation.

It is evident that evergreens, on account of the persistency of their foliage, are better windbreaks than deciduous trees.

Motion in being arrested produces friction, and friction, between any kind of bodies, produces heat. Therefore, evergreens will not only develop more heat but their trunks indicate a higher temperature than deciduous trees. Thermometers inserted in their trunks show a varying temperature of from three to five degrees in favor of the evergreens, according to the strength of the wind arrested.

It, therefore, remains to determine the thermal equivalence of motion. If we, knowing the mass and velocity of a body in motion, can determine the quantity of heat evolved by its arrestation, then the problem proposed admits easily of a mathematical demonstration.

The physical law, determined by the experiments of Dr. J. P. Joule, is, that 772 lbs. falling one foot, or, which is the same thing, one pound falling 772 feet will raise the temperature of a cubic foot of water through one degree of Fahrenheit.

Now, what is the mechanical effect the *vis viva* of this force whose thermal equivalent is one degree in a cubic foot of water? The *vis viva* is the amount of work a body in motion will perform before it comes to rest. It is found by multiplying the mass (weight) by the square of the velocity; and the law is expressed by the algebraic formula *vis viva* $M\,v^2$.

But what is the velocity of a body falling one foot from a state of rest? A falling body being continuously acted upon by gravity, is constantly accelerating its velocity. The final velocity of a body falling one foot from a state of rest, must therefore be ascertained.

The space described by a body falling from a state of rest under the influence of gravity is ascertained by actual experiment to be 16 1-12 feet during the first second; during the second second 64⅓ feet; during the third second 144¾ feet; and during the fourth second 257⅓ feet. From these facts, the law of motion, under the effects of gravity, is determined to be the square of the time in seconds, multiplied by 16 1-12. This law is expressed by the formula s (space) = 16 1-12 $T.^{2.}$

Actual experiments also have determined that the final velocity a falling body has acquired during the first second, is 32 1-6 feet. For if it received no further impulse from gravity, it would pass, during the next second, over 32 1-6 feet of space. If it falls two seconds, its final velocity will be 64⅓ feet; if three seconds, 96 1-12 feet; and if four seconds, 128⅔ feet. Hence the law of the final velocity of a falling body, is 32 1-6 (the final velocity at the end of the first second) multiplied by the number of seconds since it started from a state of rest. This law is expressed by the formula v, (velocity) = 32 1-6 T.

We have now two equations, expressing two laws; first, that of motion, and secondly, that of final velocity under gravity,

That is s = 16 1-12 T^2 and
v = 32 1-6 T.

From these we can easily ascertain the final velocity of any falling body for any given space.

[One page of the manuscript, which gives the algebraic ploblems or statements by which the conclusions are reached or proven, is here omitted, as we have not the algebraic characters to set it up so as to be intelligible.—PRINTER.]

Since the *vis viva* is 49,408 lbs, therefore this latter is equal to one degree of heat, in a cubic foot of water.

It has already been stated that the *vis viva* of the weight or mass (M) of a body, and its velocity v, is always expressed (*cæteris paribus*) by the formula $M\,v^{2}_{1}$. Hence two bodies of different weight (M and M_1) with different velocities (v and v^1) possess equal *vis viva*, if the condition $M\,v^2 = M_1\,v_1^2$ is satisfied. If, therefore, the weights of two bodies, and their velocities, are known, the equivalence of their *vis viva* can be determined.

Assuming that a cubic foot of air weighs 0.08 lbs (which it does, within a small fraction), we determine the masses of air, per second, for winds moving with the respective velocities, to be as follows:

20 miles per hour = 29⅓ feet per second = 2.35 lbs.
25 " " = 36⅔ " " = 2.93 lbs.
30 " " = 44 " " = 3.52 lbs.
40 " " = 58⅔ " " = 4.69 lbs.

The *vis viva*, respectively, are as follows:

That of 20 miles, 1786.7755 lbs per second.
" 25 " 3938.8369 " "
" 30 " 6814.72 " "
" 40 " 16140.9 " "

And the time required to raise the temperature of one cubic foot of water through one degree of Fahrenheit, is:

That of 20 miles, 28 seconds, nearly.
" 25 " 12¼ "
" 30 " 7¼ "
" 40 " 3 1-16 seconds.

But since, if equal weights of water and air are compared, the capacity of water for heat, as compared with that of air, is found to be four times that of air; and, since water is about 800 times heavier than air, therefore the heat required to raise the temperature one degree in a cubic foot of water, will raise the temperature one degree of four times 800, or 3,200 cubic feet of air.

From this we determine that the winds having the aforesaid velocities will, in one minute, heat the following dimensions of air one degree:

20 miles, 6,859 cubic feet.

25	"	15,360	"
30	"	26,464	"
40	"	52,800	"

Suppose now there is interposed an evergreen hedge a mile long and 20 feet high, so dense as completely to arrest a current of air; this hedge will present 105,600 square feet to the action of the wind. Since the temperature of the aforesaid number of cubic feet is raised one degree by the heat evolved in one minute from the action of the wind upon one square foot of surface, the heat evolved by a hedge of 105,600 square feet of surface would be, for the winds having the aforesaid velocities, as follows:

	10		50		100	
20 miles,	724,310,400	cubic feet.	144,862,080	cubic feet.	72,431,040	cubic feet.
25 "	1,622,016,000	"	324,403,200	"	162,201,600	"
30 "	2,794,598,400	"	558,919,680	"	279,459,840	"
40 "	5,575,680,000	"	1,115,136,000	"	557,568,000	"

If we take the mechanical equivalent of a wind moving 30 miles an hour, and beating against such a hedge as we have supposed, we find that the heat evolved in one minute is more than enough to raise the temperature of the air ten degrees in a room 3,000 feet long, 3,000 feet wide and 31 feet high; and in one hour, of 60 such rooms; and in ten hours, of 600 such rooms.

Again, since the hedge is one mile, 5,280 feet, long, the heat evolved in one minute would be adequate to heating a room ten degrees, of 5,280 feet long, 1,700 feet wide, and 31 feet high; in one hour a room of the same height, 5,280 feet wide, 102,000 feet long; and in 10 hours, a room of the same height and width, and 1,020,000 feet long, or 193 miles long, one mile wide, and 31 feet high.

These calculations, based upon the ascertained and established laws of physics, show the amount of heat evolved is enormous; and is a demonstration, as far as temperature is concerned, of our proposition that human agency can effect climatic modifications.

The demonstration is clear and complete of man's ability to command and use the forces of nature for his own comfort and well-being, and of that of the whole animal kingdom. A heavy responsibility, therefore, rests upon him; for if he can, and does not, avail himself of the means placed within his reach for modifying the rigors of climate, he is grossly culpable of abusing the authority confided to him by the Almighty, "to have dominion over the fowls of the air, and over the cattle, and over all the earth." For if he can temper the wind that it will not visit roughly even the shorn lamb, and does not do it, he is responsible for all the suffering caused to any creature by the rigors of an unmitigated climate. It is an unquestionable fact that the climates of the Upper Susquehannah, of the Juniata, Potomac and Shenandoah are not subject to such extremes of cold as the same latitudes are in the valley of the Mississippi. They are too remote, besides they are cut off by a range of mountains from the Atlantic, to feel its modifying influence. Their more equable temperature must, therefore, be owing to some other cause. What other cause can there be but the fact that the Arctic storms, which visit the valley of the Mississippi with such destructive and merciless fury, never reach these sheltered valleys? Why? Because they are arrested by the interposition of the Apalachian chain, and their fury converted into genial heat for the comfort of the inhabitants of these protected valleys.

Sailors have, from time immemorial, asserted the seeming paradox that a storm warms the sea. Thermometrical observations have now established it as a fact, that the difference of temperature in the ocean before and after a storm varies sometimes as much as two degrees of Fahrenheit; showing beyond question that its temperature has been raised, during the storm, the number of degrees of difference.

It is also a well known fact that along the lakes on the Canadian border, the temperature of the climate is much modified by the presence of these large bodies of water. The same Arctic storms that sweep the valley of the Mississippi pass over these lakes also, but their fury is so much tempered by the water that they never show the same extreme rigorous cold they do further west. It is also well known that the peach crop on the eastern shore of Lake Michigan scarcely ever fails, even when further south the storm has swept it clean to below the mouth of the Ohio. In part, this modification is due to the radiation of heat from the unfrozen water, which we have already seen amounts to one degree of Fahrenheit in 3,200 cubic feet of air, for every degree of heat lost by one cubic foot of water. But taking the fact furnished by the ocean, the water of the lakes may itself be warmed two degrees, and consequently may add two degrees of heat to every one degree of simple radiation.

It is to be regretted that thermometrical observations have not been made with reference to the influences that timber exerts in modifying the temperature of those gelid storms proceeding from the Arctic zone, that sweep more or less, every winter, the basin of the Mississippi. This might easily be done, and the exact difference determined between the temperature observed along a line of timbered lands, and along a similar line on the open prairie. For such lines often lie parallel to the axis of the storm. The great storm of January, 1864, moved nearly on the same parallel of latitude from west to east. At Kansas City, where it struck the timbered land after traversing the treeless plains between the Missouri and the Rocky Mountains, the temperature observed was about 29° below zero; in St. Louis county it was about 22° below, and at Cincinnati it was 12° below; at Portsmouth, Ohio, at zero, only; showing that in its course between Kansas and Cincinnati it warmed up 17°, and from Kansas to Portsmouth, Ohio, at the mouth of the Scioto, 29°.

As a general thing, a storm from the west, northwest or north is five degrees colder at Kansas City than at St. Louis. This difference is attributable to the fact that no storm can reach St. Louis without passing through a more or less densely timbered district for 150 to 200 miles; while it reaches Kansas from any of these points through an almost treeless region.

But it is not necessary to establish a general fact by special examples, when the general fact is almost everywhere admitted. But a few other illustrations of a different character will not be out of place.

The climate of the New England States, it is admitted, has become colder since the partial denudation of the mountains and the destruction of the evergreen forests of Vermont and New Hampshire have taken place to supply the demand for timber. While the immense pine forests of Wisconsin and the northern part of Michigan remained untouched by the lumberman's axe, peaches were a sure crop in the central part of Michigan and northern Indiana, while now they cannot be raised at all.

Everybody has a notion that trees for wind-breaks are necessary to shelter orchards, vineyards, dwellings, barns and stock from the fury of cold winds; yet, as far as I know, not a solitary instance is on record of any observations made to determine the thermal effect of these wind-breaks. My neighbor, Mr. Henry Shaw, at his Botanical Garden, has a dense hedge of Scotch fir (*Pinus Silvestris*) about a thousand feet long and about fifteen feet high, extending north and south along the west line of his Fruticetum. One bitter cold day, when the wind was blowing from the west at the rate of about 20 miles an hour, curiosity induced me to make some thermometrical observations along the exposed and sheltered sides of the hedge. The day was cloudy and the time between two and three o'clock, so if there was any solar influence it was on the west side of the hedge. On the west side the thermometer indicated 9°, on the east side, partially hung in the hedge, 15°. Passing eastward, with a considerable ascent of the ground, the mercury gradually sunk, and at about ninety feet east of the hedge it stood 11°. A trial at different stations on both sides of the hedge, gave the same average results.

RAIN.

Another modification wrought would be the increased amount of summer rains. In the Bible we read of the "early and latter rain." The latter rain was essential in Palestine to an abundant harvest, coming at the time when it was needed to fill the ear and mature the seed. At present the latter rain is entirely unknown. Why? Because in the whole length and breadth of the land there are no trees except in gardens where they are cultivated for fruit or shade. If a shrub springs up on the plains, it is gathered by the improvident Arab for fuel. The whole land has therefore become a scorched desert plain in summer, and a bleak, barren, dreary prospect in winter. It no more answers the description of a "land flowing with milk and honey." Milk there is none, for there is no herbage for cattle; and as for honey there may yet linger a few surviving but impoverished colonies of bees in the rocks of the desolate mountains.

To the east of Palestine the land has been reduced to the same sterility and desolation by the ignorance and improvidence of man. There are the ruins of immense cities, of Palmyra and others, once the seats of commerce, wealth and refinement, situated on plains once fertile and productive, not only of the necessaries, but also of the luxuries of life. Those plains, rainless in summer, and swept by keen, bleak winds in winter, are now treeless and consequently sterile, and uninhabitable even for the wolf.

The Hon. Geo. P. Marsh, speaking from personal observation, in his "Man and Nature," says: "There are parts of Asia Minor, of northern Africa, Greece, and even of Alpine Europe, where the operation of causes set in motion by man, has brought the face of the earth to a desolation almost as complete as that of the moon; and though within the brief space of time men call the 'historical period,' they are known to have been covered with luxuriant woods, verdant pastures and fertile meadows, they are now too far deteriorated to be reclaimable by man."

The facts stated are undeniable, and the causes assigned for them are only too true; but we demur to the conclusion that these desolate wastes are irreclaimable by man.

If we measured man's ability by the efforts of a single generation, we would be compelled to assent to the desponding conclusion of Mr. Marsh. But as not one, but one hundred generations, working unconsciously, were required to produce this melancholy result; so the intelligent and persistent effort of ten generations can restore these regions to their pristine beauty and fertility.

However, we cannot pursue this subject further. It is entirely too vast, and an outline of it would pass beyond the reasonable limits of an essay. We, thererore, wish to call your attention merely to a few pertinent physical facts, established by a long series of observations.

If you examine "Blodgett's Rain Map," you will find that the line that marks the greatest amount of summer rain, coincides with the line that marks the limits of continued forests.

There has been an attempt made to explain this physical fact, by asserting that these forests owe their existence to those summer rains; and that beyond these limits the forests fail because the rains fail. In our humble judgment this is putting the effect for the cause.

It is undeniable that the spring, autumn and winter rains on the treeless plains, east of the Rocky Mountains, are as abundant and as copious as the average in the same latitudes anywhere in the Mississippi basin. Why then are summer rains the exception? This question resolves itself into another and a simpler one, namely: Why does the aqueous vapor that drifts over these plains condense in spring, autumn and winter, and not in summer?

The condition necessary for the condensation of aqueous vapor is, that the air containing it must become cooler than the temperature that determines the point of saturation for any specific atmosphere. In such case the surplus vapor, if any, condenses and is precipitated as rain. In the three seasons that rain falls on these plains, the clouds, or vapor, as the case may be, are losing heat by radiation to the earth. Instead of, as in summer, receiving heat by radiation from the earth. In the latter instance no precipitation can take place, because the superincumbent atmosphere, instead of losing heat, is actually receiving it, and with an increase of temperature its capacity for holding vapor is also increased.

Another remarkable fact corroborating this view, is that summer rains, when they do occur on these plains, almost invariably occur during the night. Why is this? Because the earth's surface over these plains may, by radiation, become cooler during the night than the clouds or vapor hanging over them. The latter parting with some of their heat, to establish an equillibrium between them and the earth, may be reduced in temperature below the point of saturation. Hence the summer rains occur generally in the night time.

The general observation, that in the Mississippi basin the heaviest summer rains fall during the night, is explicable upon the same principle. But in what manner do trees effect condensation, and the precipitation of summer rain on the regions occupied by forests? By the same general principle. We all speak in our moments of poetical inspiration of "the cooling shade." But in this instance there is as much philosophy as poetry in the expression. The shade is cool not alone because the ground is protected from the scorching rays of the sun, but because there is a cooling operation going on in the leaves above us. In winter, when we warm ourselves by a wood fire, do we ever ask ourselves, whence comes this heat we feel?

What is going on in the fire is a mere chemical combination, that reduces the wood to its original elements. But the energy of the oxygen in this combination liberates the summer heat absorbed and stored up, when, by the chemical action of the solar rays, the leaves converted a few mineral salts, hydrogen and carbonic acid into woody fibre. How wonderful, this great law of compensation working in all the departments of nature! It not only keeps everything in equilibrium, but here in the grateful, cooling shade the great work goes on, storing up the surplus of summer heat to warm us in the winter.

The reason, then, why clouds are formed above, and rains precipitated on the continuous woody districts, is because the heat which the sun radiates on a forest is absorbed, or if you please, consumed in the production of wood, and not radiated back into space, as is the case when it falls on the naked earth. The clouds or vapor that may drift over the forest, instead of being dissipated by receiving radiated heat, will themselves lose heat by radiation on the cool forest below, and hence condense into abundant rains.

Here we have a full explanation, not only why the limits of the greatest amount of summer rains coincide with the line of continuous forests; but also why, on the naked sandy plains of Western Texas, New Mexico and Arizona, summmer rains are almost unknown.

Surveying, then, the whole field in the light furnished by the facts, the task of determining the means to be used is easy. There was a project, last winter, before Congress to make a donation of land to a company, upon the condition that it would plant a belt of evergreens from the Missouri to the Rocky Mountains. If it had been adopted, it would in all likelihood have ended in another swindle of the Government, as such projects generally do. However, if the project could be carried out in good faith, an immense benefit would result from it; but still it would be inadequate to affect the object. Not one, but many belts of timber (evergreens if possible) should run not only latitudinally, but also longitudinally. The government has, and is paying a heavy subsidy to railroad companies building roads across these plains. In part consideration for this subsidy, the government should require that the companies plant hedges of evergreens on each side of their roads. These would be worth all their cost to the companies in protecting their property against storms, besides their immense modifying influence on the thermometric and hygrometric condition of the climate. The States, formed and forming on the plains, should exact the same of all railroad companies chartered by them, and it should be made obligatory on the counties to plant similar hedges along all the public roads. Soon these would furnish seed that would be scattered broadcast over the land by the winds; and pine forest would spring up on all uncultivated lands. The grand result of the whole would be, that the climate would be so much modified as to become as mild and equable as it is on the east side of the Alleghanies where not affected by the ocean. Not only so, but it would furnish our prosperity an abundant supply of timber, of which they will stand much in need; for the present sources of lumber will be exhausted before two more generations have passed away.

The question involves many considerations appealing equally to our sympathies, interests, comfort, happiness and humanity. Modification of climate will add to the comfort both of man and beast; it will give a wider scope, more varied and abundant supplies of the necessaries and luxuries of life, a greater capacity to the natural resources of the land, and it will make amends to posterity for the wrong we have done are still doing in the ruthless destruction of forests. It will gladden not only our own hearts, but those of our children, and our children's children will rise up and bless us.

Upon the conclusion of Mr. Tice's essay, Dr. Edwards moved that as this was the day set apart by our National and State authorities as a day of general thanksgiving to Almighty God, we now adjourn till afternoon.

Mr. Colman.—I appreciate most fully the motion of Dr. Edwards, and the motives for it. But our time is very short, and for one I should like to hear an address from Dr. Read, President of this University. I am of the opinion that Dr. Read will consent to address us at this hour, we shall all be benefited and instructed as much or more than we should by adjourning. I make this motion as a substitute for Dr. Edwards' motion. The substitute was adopted.

Dr. Read then proceeded to address the society in regard to the importance of horticultural and agricultural education, and gave a history of the congressional grant for the establishment of agricultural colleges.

Upon the conclusion of Dr. Read's address, Dr. Spalding offered the following:

Resolved, That this society recognize the great importance of the subject brought to our notice in the able address of President Read before the society, and earnestly request the newspapers of the State to publish it.

Mr. Mudd.—The resolution expresses the facts of the case.

Dr. Spalding presented the following, which was seconded by Mr. Woods, and adopted:

Resolved, That this society sincerely regrets that the liberal policy heretofore pursued by the former President and other officers of the North Missouri railroad has been entirely abandoned and reversed by the present administration of the road; and that in the opinion of this society the progress of horticulture in the State has been retarded, while the interests or income of the road have in no degree been promoted or increased by this change of policy.

Dr. Morse.—I feel an interest in this road. It is said that the policy of the road was formerly too liberal and was abused. In the beginning of the year a new policy was inaugurated, and the present President has tried to carry out this policy during the year. It may and will likely be changed next year.

President Read.—I think the resolution a mild one. In this case the policy has been unnecessarily harsh. I am satisfied that a different policy will be pursued in the future.

Dr. Spalding.—Some of the directors went to the President to get him to make some concessions. He had departed from this policy in the case of the St. Louis fair, and might be induced to do so again.

President Peabody.—Some of us went down on the Iron Mountain railroad to visit the orchards, on which occasion we discovered that dreaded disease in the peach trees from which we have hitherto been exempt in this State, *The Yellows*. In connection with the Illinois friends we got a photographic picture of the disease.

The pictures are here and are to be disposed of by the society. More of them can be obtained.

Mr. Mudd proposed that it be audited like other bills, and the pictures sold by Mr. Tice, treasurer, at 50 cents each. Adopted.

Adjourned.

AFTERNOON SESSION.

The society was called to order at 2 o'clock.

The President announced the following

STANDING COMMITTEES FOR 1869.

Business—H. T. Mudd, St. Louis.
Wm. Stark, Louisiana.
O. Root, Columbia.

Entomology—C. V. Riley, St. Louis.
Dr. J. G. Norwood, Columbia.
Dr. E. S. Hull, Alton.

Flowers—M. G. Kern, St. Louis.
Dr. G. S. Morse, Columbia.
N. J. Colman, St. Louis.

Vineyards—J. M. Jordan, St. Louis.
W. C. Flagg, Alton.
Dr. B. F. Edwards, Kirkwood.

Orchards—L. D. Votaw, Eureka.
O. H. P. Lear, Hannibal,
T. W. Guy, Sulphur Springs.

The Vegetable Garden—
A. E. Trabue, Hannibal.
Dr. Edwards, Kirkwood.
C. W. Murtfeldt, St. Louis.
Wm. Stark, Louisiana.

Ad Interim, North Missouri—
H. M. Vories, St. Joseph.
R. L. Todd, Columbia.
Dr. G. M. Dewey, Keytesville.

Ad Interim, South Missouri—
Dr. L. D. Morse, Kirkwood.
C. W. Murtfeldt, St. Louis.
Isidor Bush, Bushberg.

Committee on Weights of Fruits, Continued—
Dr. B. F. Edwards, Kirkwood.
Wm. Muir, Fox Creek P. O., St. Louis county.
H. T. Mudd, St. Louis.

Committee on Gallizing, to report at next meeting—
C. W. Murtfeldt, St. Louis.
T. W. Guy, Sulphur Springs, Jefferson county.
Wm. Stark, Louisiana.
Dr. L. D. Morse, Kirkwood.
John H. Tice, St. Louis.

DISCUSSIONS ON SMALL FRUITS.

Dr. Edwards.—Does the blackberry require replanting? There are several places where the canes are becoming small, and look as if they are dying out.

N. J. Colman—I have had considerable experience with the blackberry. It is very exhausting to the soil, and requires very liberal manuring or you must change it in from 4 to 5 years. I have a patch 10 to 12 years old. It occupies an old barnyard and yields immense quantities of large fruit. Bottom land is best for them, unless you manure well.

Dr. Edwards—In one of the places I spoke of it has been well manured. While upon the blackberry, would like to hear so ething of their productiveness; last year they were killed. I had no crop but from the Kittatinny; they had good crops. Some may find it well to plant this instead of the Lawton.

Another fruit I have paid some attention to this summer is the rasberry. I have tried several varieties, and think now we have a berry that will do well over our whole region. Never had anything equal to it. Chas. Downing sent me 2 plants of it 2 years ago. P. B. Mead told me of it 4 years ago. It is as good as the Antwerp; as hardy and as productive as the Blackcap. They outbear the Blackcap. They are the Clarke raspberry. (Exhibits a drawing of it).

N. J. Colman—While speaking of the raspberry, the Philadelphia should be noticed. It is among raspberries what the Wilson is among strawberries. The Clarke may be better. I intend to try it. I am more than satisfied with the Philadelphia after several years trial.

Of blackberries, I think the Kittatinny is hardier than the Lawton. I think that one loss of the blackberry was from their going into the winter in bad condition from the drouth of summer. It is said to have the fault of not ripening its crop at once. This makes it good for the family, but not for marketing. I think Wilson's Early is tender.

Dr. Edwards—I have had the Philadelphia, and it is better than any other until we got the Clarke.

This year Mr. Parry sent his Clarke raspberries 60 miles and they sold for 60 cents, while the others brought only 40 cents a quart. Several societies in the east, where it is known, have endorsed it.

I agree with Mr. Colman, that the Lawton was not killed in the winter, but in the fall.

Mr. Trabue—I think the Clarke will be tender; they are making a very late growth this fall.

Dr. Edwards—It has been tried by Mr. Campbell of Ohio, for some years, and it stood when the thermometer fell 21° below zero.

Mr. Trabue—I don't think it will. There is a fault to the Philadelphia—it is hard to get from the receptacle.

C. V. Riley—I think that is the case.

The Committee on Fruits on the Table presented the following

REPORT.

By O. H. P. Lear—Pryor's Red, Esopus Spitzenberg, Smith's Cider, Peck's Pleasant, Little Romanite, White Winter Pearmain, Winter Rambo, Carthouse, Newton Pippin, Golden Gate, Northern Spy, Dominie, Willow Twig, Raule's Janet, Wine Sap, Virginia Greening, Roman Stem, Western Red, Grindstone, Macafee Red, Ben Davis, Baldwin, Milam, Little Pearmain, Pennock, Cannon Pearmain, Milam Seedling, too much like the Milam to be cultivated as distinct, Lear's Seedling, not worthy of cultivation, Sheep's Nose; two apples for name.

This is the finest display we have ever seen on the table of the society from one man—not always the best specimens, but very good for this year.

Several varieties injured by the Codling Moth, which insect we advise our friend by all means to try to keep under.

Also, an apple called the Stark, presented by Alex. H. Gaston, with a description. Considered by the committeee and several members to whom they submitted it, as good, and worthy of further trial.

N. J. Colman exhibited Ben. Davis, Wine Sap, Janeton, Willow Twig, and Cannon Pearmain.

Mr. Guy observed that while many specimens were injured by the Codling Moth, several were injured by the Scab and Mildew.

Report accepted.

A resolution was adopted recommending the *American Entomologist*, published by R. P. Studley & Co., of St. Louis, at one dollar per year, to the careful attention of all fruit growers.

Mr. Woods, offered the following, which was adopted:

Resolved, That inasmuch as in the creation of the office of State Entomologist, a wise forethought and considerate guardianship over the interests of the cultivators of the soil was exhibited by our last State Legislature, we cannot separate without expressing our high appreciation of that action, and the hope that this aid may be continued, so as to enable us to combat successfully those multifarious and insidious enemies.

The place of the next meeting being brought up for discussion, some feeling was expressed as to the want of interest exhibited by the majority of the citizens of Boone county in the objects of the society.

It was finally

Resolved, That the president be empowered to call the next meeting at such time and place as he thought most suitable.

Adjourned *sine die*.

LIST OF FRUITS ADOPTED AT THE NINTH ANNUAL MEETING, JANUARY, 1868, AND RECOMMENDED BY THE SOCIETY.

Apples.—Summer, for market: Early Harvest, Red June, Red Astrachan, Sops-of-wine.

For family: Same, adding Benoni, Sweet June, American Summer Pearmain, Early Strawberry, Summer Queen.

Fall, for market: Maiden's Blush, Rambo, Hubbardston Nonesuch, Famuese, Ramsdell Sweet.

Early Winter: Wine or Pennsylvania Redstreak, Smith's Cider, Porter, Fall Queen, Pryor's Red, Rome Beauty, Moore's Sweet.

For family: Yellow Bellflower, Peck's Pleasant, Rhode Island Greening, American Golden Russet, Jonathan, Newtown Spitzenberg, Wagener, Fallawater.

Late Winter, for market: Rawle's Janet, Newtown Pippin (on lime stone soils,) Willow Twig, Winesap, Gilpin, Ben Davis, Ladies' Sweet, White Winter Pearmain.

For Cider: Winesap, Gilpin, Rawle's Janet.

Promising well for trial in Missouri: Esopus Spitzenberg, Bailey's Winter Sweet, Autumn Pearmain, Belmont, Early Joe, Elleck's Winter Sweet, Evening Party, Fulton, Haskell's Sweet, Hermann, Minkler, Keswick Codlin, King of Tompkins county, Kirkbridge White, Lemon Pippin, Limber Twig, Ortley, Westfield Seek-no-further, White Pippin, William's Favorite, Huntsman's Favorite, Tenbuer's for cider.

Pears.—Summer, for market: Doyenne d'Ete, Beurre Giffard, Tyson, Bartlett.

For family: The same, adding Rostiezer and Dearborn's Seedling.

Autumn, for market: Howell, Beurre d'Anjou, Flemish Beauty, Louise Bonne de Jersey, Seckel, (standard,) White Doyenne, Buffum, Napoleon, Duchess d'Angoulême, Beurre Bosc, (standard,) Beurre Diel.

For family, same list.

Winter, for market: Glout Morceau, Winter Nelis, Lawrence, Vicar of Winkfield (excellent for cooking,) Easter Beurre.

For family, same list.

Two best Pears of each season for market: Summer—Doyenne d'Ete and Bartlett. Fall—Louise Bonne de Jersey and Beurre Bosc. Winter—Easter Beurre and Winter Nelis.

Peaches.—Hale's Early, 20th of July, F.
Troth's Early, 26th of July, M. F.
Large Early York, 10th of August, M. F.
George IV, 15th of August, M. F.
Old Mixon Free, 15th of August to 1st of September.
Columbia, 1st of September.
Late Crawford, 1st to 15th of September, F.
Old Mixon Cling, 5th of September.
Ward's Late Free, 15th to 20th September.
Smock's Free, 20th September, M. F.
Red Cheek Melacaton.
Heath Cling, M. F.
Washington Cling.
Late Admirable.
Early Crawford.
Lagrange, F.
Morris' White, F.

Yellow Rareripe, F.
President, F.

This dates for about the latitude of St. Louis.

Cherries.—Black Tartarian, May Duke, Early May, Governor Wood, Gridley, English Morello, Belle de Choisy.

Heart and Bigarreau varieties are tender in most locations in this State.

Apricots.—Large Early, Early Golden, Hemskirke, Peach.

Nectarines.—Elruge, Pitmaston's Orange.

Plums.—Jefferson, Smith's Orleans, Diamond, Pond's Seedling, German Prune, Lawrence's Favorite, Ickworth Imperatrice, Washington.

Strawberries.—Wilson's Albany, M., Longworth's Prolific, M. F., Russell, F., Cutter's Seedling, F., McAvoy's Superior, F.

Raspberries.—Doolittle, M. F., Purple Cane, M. F., Miami (trial,) Philadelphia (trial,) Catawissa)trial.)

Blackberry.—Lawton, Kittatinny (trial,) Wilson's Early (trial.)

Currants.—Cherry, Red Dutch, White Grape, White Dutch.

THE ZONALE GERANIUM.

LIST OF OFFICERS FOR 1869.

Charles Peabody, St. Louis, President.

J. M. Jordan, St. Louis,	**Vice President,**	**1st**	**Congressional**	**District.**
T. W. Guy, Sulphur Springs,	"	**2d**	"	"
J. B. Olhausen, Cape Girardeau,	"	**3d**	"	"
Felix F. Fine, Springfield,	"	**4th**	"	"
F. A. Nitchy, Jefferson City,	"	**5th**	"	"
G. M. Dewey, Keytesville,	"	**6th**	"	"
H. M. Vories, St. Joseph,	"	**7th**	"	"
O. H. P. Lear, Hannibal,	"	**8th**	"	"
A. E. Trabue, Hannibal,	"	**9th**	"	"

C. W. Murtfeldt, St. Louis, Corresponding Secretary.
Wm. Muir, Fox Creek, Recording Secretary.
J. H. Tice, St. Louis, Treasurer.

STANDING COMMITTEES.

Business—**H. T. Mudd, St. Louis,**
Wm. Stark, Louisiana,
O. Root, Columbia.

Entomology—**C. V. Riley, St. Louis,**
Dr. J. G. Norwood, Columbia,
Dr. E. S. Hull, Alton, Ill.

Flowers—**M. G. Kern, St. Louis,**
N. J. Colman, St. Louis,
Dr. G. S. Morse, Columbia.

Vineyards—**J. M. Jordan, St. Louis,**
W. C. Flagg, Moro, Ill.,
Dr. B. F. Edwards, Kirkwood.

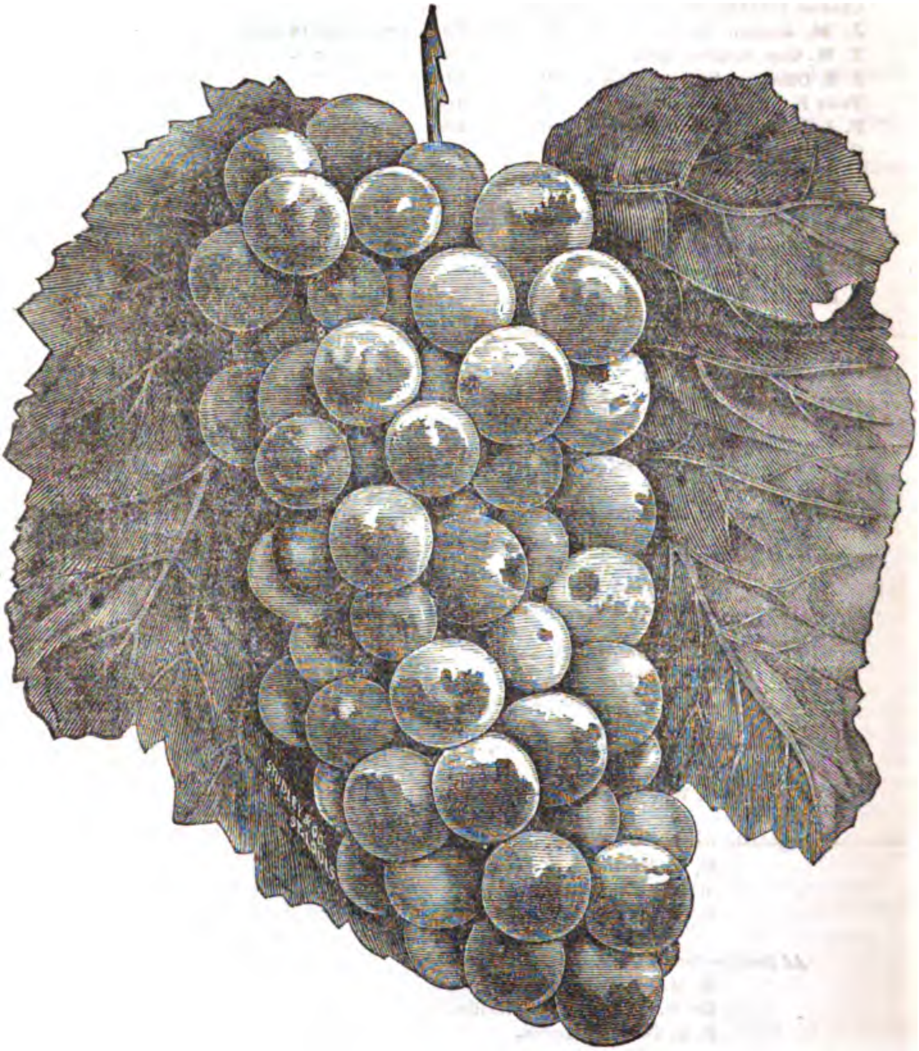
Orchards—**Carew Sanders, St. Louis,**
O. H. P. Lear, Hannibal,
T. W. Guy, Sulphur Springs.

Vegetable Garden—**A. E. Trabue, Hannibal,**
C. W. Murtfeldt, St. Louis,
Wm. Stark, Louisiana,
B. F. Edwards, Kirkwood.

Ad Interim Committee, Northern District—
H. M. Vories, St. Josesh,
Dr. G. M. Dewey, Keytesville,
R. L. Todd, Columbia.

Ad Interim Committee, Southern District—
Dr. L. D. Morse, St. Louis,
C. W. Murtfeldt, St. Louis,
Isidor Bush, Bushberg.

Committee on Gallizing, **to report at next meeting**—
C. W. Murtfeldt,
T. W. Guy,
Wm. Stark,
Dr. L. D. Morse,
John H. Tice.



THE CASSADY GRAPE.

Mr. George Husmann, of Hermann, Mo., has had this grape in cultivation for ten years. Several others at Hermann, and in a few other localities, have been growing it to some extent for several years. It originated in Philadelphia, is a white grape, has a thick skin, pulpy, but possesses a peculiar honeyed sweetness, found in no other grape. It ripens with the Catawba, and is remarkably productive. In a southern exposure its leaves are subject to sun-scald. Mr. Husmann has found it uniformly productive, and recommends it for trial on deep, rich, sandy soil, on northern or northeastern exposures. It makes a very superior white wine.

PROCEEDINGS

OF THE

MISSISSIPPI VALLEY GRAPE GROWERS' ASSOCIATION.

SPRING AND FALL MEETINGS, 1868.

PROCEEDINGS.

ST. LOUIS, May 7, 1868.

The Annual Meeting of the Association was held in the Supreme Court room. President Spalding in the chair.

The President, on calling the meeting to order, stated that the copies of the programme for this meeting were lost at the recent fire which destroyed the printing office of R. P. Studley & Co., and suggested that a Business Committee be appointed; which was so ordered.

J. M. Jordan, George Husmann and E. A. Riehl were appointed said committee.

The President of the State Horticultural Society, the Rev. Chas. Peabody, tendered two hundred copies of the Annual Report of the State Board of Agriculture to the members of the association:

The President then delivered his annual address, as follows:

PRESIDENT'S ADDRESS.

A year ago a few earnest men, devoted to the culture of the grape, met in this place for the purpose of organizing an association whose efforts should be directed exclusively to the promotion of the interests of that particular branch of Pomology.

The experience of the year, no less than the number of intelligent growers that I now see before me, sufficiently vindicates the wisdom of the movement. Our labors, as an Association, have but just commenced, and yet the benefits resulting therefrom are too apparent to be brought into question. There are so many points connected with grape culture that may be profitably studied and discussed; there is so much yet to learn relating to the subject; so many important questions not yet fully determined, that the field for investigation and experiment, which lies open before us, is ample to occupy the time and thought of every member of this Association for years to come. We may therefore safely regard our young society as one of the fixed institutions of the day, and prepare ourselves to enter upon the work which was contemplated in the organization with that earnest spirit and resolute determination which are necessary, in order that results at all commensurate with the noble task we have set before ourselves may be achieved and their benefits realized.

A great work is to be done—great in its commercial importance, great in its influence upon society, and great in its pecuniary aspect to all those who engage in grape culture as a pursuit. And this society, if it is true to itself and faithful in the discharge of its duties to the public, will contribute in no small degree towards its final accomplishment.

The commerce of the Nation in wines is to be revolutionized. The fiery and consuming alcoholic liquors, and the sluggish and stupefying beer are to give place to the enlivening and health-giving products of the wine. While the best modes of culture, and the varieties of the grape best suited to all the various sections and localities in this broad valley are to be so accurately determined, that he who adopts the recommendations of this Association may do so in the fullest confidence that when intelligently applied and faithfully carried into practice they will insure ultimate success.

These results, however, are not to be accomplished in a day, nor by the labors of any individual. They can only be attained by the persistent, united efforts of this Association. Every member of this body has a share of this work to do, and if each performs his peculiar task to the best of his ability, our combined endeavors will soon bring results beneficial, both to ourselves and to the public. We cannot all do the same things equally well. One can do one thing and another another. One can experiment, another observe, and each contribute to the common stock by reporting the results. Another, again, can treat some division of the subject in its more scientific aspects. In this way both the art and the science of our calling, in all its details, will be gradually but steadily developed.

I call your attention at this time to the different topics embraced in the general subject, that we may not, even for a time, lose sight of the magnitude and importance of the work in which we are engaged.

It is my purpose, as one among you, to do my proportionate share of the labor, and it is with this purpose in view that I have given some attention to an investigation of the climate of our section of the Mississippi Valley, with a view of determining, as far as possible, the well known diversity of climate in similar parallels of latitude, and consequently of their varied adaptability, independent of the question of soils, to the successful culture of the grape. The two important natural conditions demanded by the grape are climate and soil. Given these two, all the rest will naturally follow from the application of the skilled industry of the vine-dresser.

Climate is an indispensable condition. If you go beyond certain limits, failure is almost certain. While, within certain boundaries, success in a greater or less degree is attainable on a great variety of soils. In this portion of the Valley of the Mississippi we find these two elementary conditions, climate and soil, existing together. That the soil and climate of Missouri and the adjacent parts of other States, especially those on its eastern and western boundaries, are eminently adapted to the growth of the grape, is a point too well established to need discussion here. The fact is well known and universally acknowledged throughout the entire district, and perhaps I may venture to add throughout the United States. Europe also is to some extent aware of our advantages in this respect. Compared with other sections of the United States (at least all those lying east of the Rocky Mountains), so far as their capabilities have been tested, our advantages for the production of wine are certainly superior.

The culture of this fruit for table use is practicable over a large extent of territory, and the grape is therefore found to flourish in many of the more northern States. Perhaps certain varieties which mature early, yield fruit suitable for this purpose as far north as the 44th parallel of north latitude. Wine, however, produced in these high latitudes must always be of inferior quality, and can never compete with the product of our milder and more sunny climate.

The particular soils best suited to the production of wines of high quality can, at this day, and in the present state of our knowledge on the subject, only be definitely determined by actual experience. It is not my purpose, however, to speak of the comparative value of soils. Indeed, the precise character of the soil may be classed as a secondary consideration, the primary one being that of climate. We must have the requisite temperature or the wine-making properties of the grape will not be fully developed.

Do not misunderstand my position. I do not intend to deny that there is great choice in soils; on the contrary, I assert that there is. The mineral constituents and the mechanical texture and condition of soils are very important considerations, especially if we are aiming to achieve the highest results. Yet, notwithstanding their importance, they are, in my estimation, subordinate to that of climate.

Wine-growing demands certain climatic conditions which are not regulated by definite parallels of latitude, nor yet wholly by thermal lines. Hence many sections of the country, capable of producing large crops of fine eating grapes, can never equal others in similar latitudes in the quality of their vinous products.

It was formerly the custom in making geographical divisions of the climate of the earth to divide its surface into zones. These zones were bounded by certain parallels of latitude, and were intended to express the variations of climate; but they are only imaginary divisions, and have "really no place in nature; the actual measure of heat alone constitutes the various belts of climate." Isothermal lines have taken the places formerly assigned to zones, and their courses and positions have been ascertained by actual observations of temperature along their routes continued through a series of years.

Bear in mind that these lines exhibit the mean or average temperature of their respective seasons, not for a single year, but for a series of years; the great variation of different years being incorporated into the general average.

Starting, then, at St. Louis, and running eastwardly, we find the line of mean temperature for the spring months, March, April and May, inclining a little to the south across the State of Illinois and a part of Indiana, then bending slightly northward it touches Louisville, Ky., and passes Cincinnati more than a hundred miles south of that city. Near this point it curves suddenly southward, passes near Knoxville, Tenn., and sweeps around the southern base of the Black Mountains, in the southwest part of North Carolina.

From this point it as rapidly advances northward along the eastern base of the Allegheny ridge till it crosses the Potomac river into Maryland just south of Washington City.

Reaching Chesapeake Bay, in the same latitude as St. Louis, it again turns southward, cuts across the southwestern corner of Delaware, and continues its southing till it comes within the influence of the Gulf Stream.

Our mean temperature for the spring months is therefore identical with that of Louisville, Ky., Knoxville, Tenn., the southwestern part of North Carolina, Alexandria, Va., the southern portion of Maryland, and the extreme southwest point of Delaware.

Let us now return to our starting point, and trace the course of the same line when extended westwardly. Here, as to the east of us, we find it curving slowly southward, till it passes beyond the limits of our State, when it again declines rapidly southward, going down nearly to the latitude of El Paso, on the Rio Grande, touching the 32d parallel of latitude in the middle part of Western Texas, more than 400 miles south of this point. So far, then, as relates to the season of spring, we are virtually as far south as the southwest part of North Carolina on the one hand, and Western Texas on the other. Our mean spring temperature is 2.70 degrees higher than that of Cincinnati, and 2.30 degrees higher in summer. Cincinnati is taken, not for the purpose of making a rival comparison, but because it happens to be in nearly the same latitude as St. Louis, and has long been noted as a wine-producing district.

While the spring temperatures of the central areas of the United States correspond very nearly with those of Germany and France, still, "the western half of the continent is much the warmer for these months; and if the mountain plateaus did not intervene, the isothermals would be quite uniform in their course across the continent from west northwest to east southeast." "The district of the great lakes would make some curvature of these lines, however, as they are then colder than the average land surface of their latitudes, and a great accession of heat occurs on the plains at both sides of the Rocky Mountains." On the eastern side of the mountain range, the prevailing westerly winds cause this higher spring temperature to be felt throughout the Valley of the Mississippi, more in its western and less in its eastern parts. Along the line of the Mississippi river spring advances rapidly, and at this point we attain a summer temperature before beginning of June.

For the three months of summer, the distribution of temperature presents a greater divergence from the parallels of latitude than at any other season of the year. You will observe, as shown upon the map, that the isothermal line for the summer months varies considerably from that of spring, the difference being greater to the eastward and less to the westward of this point.

Taking St. Louis again as our initial point, with a mean summer temperature of 76.30 degrees, the isothermal line, in its extension eastward, has a direction similar to that of spring across the States of Illinois and Indiana, passing Louisville, however, some thirty miles south of that city, then, bending still more rapidly southward than does the spring line, it crosses the longitude of Cincinnati more than two hundred and fifty miles south of that city, and, continuing its southerly course, sweeps down into the western part of South Carolina, attaining a point about one hundred miles further south than the line of spring.

Turning north, it traverses the central parts of North Carolina and Virginia, passes near the cities of Washington and Baltimore, and reaches its northern limit near the head of Chesapeake Bay. Here, turning abruptly southward, this line passes lengthwise through the southern half of Delaware, and reaches the coast below the southern line of that State, and in latitude about 38 degrees; thence seaward, across the gulf stream, it touches the Bermuda Islands on a parallel of latitude quite as far south as that of Charleston, South Carolina. Westwardly, from St. Louis, the same line follows pretty nearly the valley of the Missouri river as far as the mouth of the Kansas river, where it continues its westerly course up the valley of this latter river as far as the neighborhood of Fort Riley; then, declining southward, it runs down to about 32½ degrees of north latitude, or a half degree north of the spring line at a corresponding point.

The variation of the summer line is, therefore, half a degree less to the west of us than that of spring, while towards the east it considerably exceeds it, giving us a mean summer temperature equal to that of the northwestern part of South Carolina. The comparative mean of our summer months is of much less importance than those of spring and autumn, for the reason that the summer mean is sufficiently high in all the middle States to insure a good growth of the grape.

The mean temperature of the autumn months is more nearly equal at the several points heretofore named in comparison: That of St. Louis being 55°, Cincinnati 53.9°, Louisville 54.9°, Knoxville, Tennessee, and the Black Mountains, in North Carolina, nearly the same, Washington City 57.4°, and Baltimore 56.2°. The line which passes through, or near, the last two points, extends northwardly through New Jersey, and along the southern coast of Long Island, imparting to this portion of the northern half of our Atlantic coast an autumn mean equal to our own.

The average temperature of autumn, of course, covers the entire month of November. This month should not be included in the grape season, excepting at such points as the southern shores of our great lakes, and other places where spring is retarded, and autumn correspondingly prolonged, by the influence exerted by large bodies of water.

The months of August, September and October cover the usual period of the ripening of the grape, and this is the period to be studied, if we would discover the most favorable temperature for the production of wines.

For the highest development of the wine properties of the grape, a mean temperature of no less than 65° Fahrenheit is demanded during the season of ripening.

The following table will afford a ready comparison of the recorded observations of temperature for the months of August, September and October, at four different points in the wine-growing districts of the Mississippi valley:

Stations.	Aug.	Sept.	Oct.	Av'g.	Yrs.
Cleveland,	70.3	64.0	51.3	61.68	4
Kelley's Island,	72.0	64.8	53.0	63.27	8
Cincinnati,	74.2	66.0	53.2	64.47	20
St. Louis,	76.5	68.7	55.4	66.86	23

St. Louis, as shown above, is the only one of the four points named where the mean for August, September, and October ranges above the required measure of 65° Fah., all the others falling more or less below it.

The two important constituents of climate, in its relation to grape culture, are heat and moisture. I have shown the peculiar value of our climate, so far as relates to temperature, to consist—first, of the comparatively high temperature of spring, which gives an earlier start to vegetation than takes place in corresponding latitudes elsewhere in the Mississippi valley, and which, in the latter part of the spring, amounts to such an anticipation of summer temperatures as enables the vine-growers of this district to enter upon the usual period of summer at an important advantage over those of less favored localities; and, last, of the higher range of measures for the very important period embraced by the months of August, September, and October.

So far I have confined myself to the consideration of only one of the principal elements of climate, viz: heat. I propose now to notice, very briefly, that of moisture, leaving a more elaborate exposition of this branch of our subject to a future occasion, unless some one more deeply versed in the art and science of hygrometry, should, by a fuller treatment of the subject, render any future effort of mine unnecessary.

I have shown that the general course and direction of thermal lines across our continent, where no disturbing causes interrupt their courses, is from west north-west to east south east. I have also shown that there are many deviations from this course, some of which are very remarkable; and, further, that the principal causes of these deviations are mountain ranges, elevated plateaus and large bodies of water.

The amount of rain-fall and the humidity of the atmosphere, are alike subject to perpetual variations, and constitute one of the important peculiarities of our climate.

The same causes which produce variations in thermal lines, especially the first and the last named—mountain ranges and large bodies of water—taken in connection with the influence of prevailing winds, play an important part in producing the diversity of atmospheric humidity which is known to exist in similar parallels of latitude. For instance, the extensive plains lying immediately east of the Rocky Mountains, sheltered as they are by the mountain ranges from the moist westerly winds which come over the Pacific ocean, have an atmosphere greatly deficient in moisture, especially in summer, when the prevailing winds are from the west. The vapor derived from the waters of the Pacific is largely condensed at the mountains, and on this side of the range the winds at this season are comparatively dry.

On the other hand, the Gulf States possess a very humid atmosphere, attributable to their proximity to the body of water composing the gulf, which, being of high temperature, is favorable to rapid evaporation. The tropical air of this region, also possessing a high temperature, becomes heavily charged with vapor, and as it travels northward, which is its prevailing course during the hot season, affords a heavy-fall and a humid atmosphere to the country over which it passes. It is this moist climate of our Southern States that so eminently fits them for the production of cotton. Combined with a high temperature, and a soil of exceeding fertility, they are, for this culture, perhaps without a parallel on the globe. It is precisely this humidity of the atmosphere which unfits this gulf region for the production of wine, however favorable it may be for the growth of other products.

Further north the degree of moisture in the atmosphere is less, but the temperature being at the same time lower, a more rapid condensation of vapor takes place, and hence the rain-fall continues nearly the same.

The general course of this volume of moving air is, as I have said, northward.

In our latitude it encounters the westerly winds which blow across the Plains, and its course is thus deflected eastward. Indeed, westerly winds are the prevailing ones in ALL middle latitudes, excepting in certain districts where their course is interrupted by local causes. Our geographical position is such that it escapes the FULL effect of this volume of vapor coming from the south, though it is not beyond its limits. To the west of us it becomes less and less until its influence entirely ceases, and the region beyond is, at a certain season of the year, mainly dependent upon evaporation from its own surface for the slight humidity of its atmosphere and its scanty rain-fall. To the east of us in the same latitude, the humidity of the atmosphere increases, while the measure of rain-fall remains nearly the same.

I have endeavored in this brief and imperfect manner to point out some of the advantages possessed by this portion of the Mississippi valley for the production of wine. My estimate of the principal climatic features of this region is based upon observations made at this city and at Jefferson Barracks, on the Mississippi, ten miles below.

A belt of land, a hundred or more miles in width, lying on either side of the Mississippi river, and comprising the western portion of Illinois and the eastern part of Missouri, and including also portions of Kentucky, Tennessee, and Arkansas on the south, and the southern part of Iowa on the north, may, I think, be fairly included in this estimate.

Allowance must be made, however, for the differences in the length of the season and the corresponding mean temperature as we go further north or south of this point. The fluctuations of temperature would also probably vary in proportion to the elevation of any given point, and its distance from our large rivers. Aside from the differences in soil, no such essential variations in the climate would probably be found on the same isothermal within this belt, as would materially affect the character of its wines. To the east of this belt a more humid atmosphere is presumed to exist; and to the west it is less and less humid, until a point is reached where the climate is too dry for ready propagation. How far beyond this supposed point the grape will flourish when once established, is, so far as I know, undetermined.

The belt I have indicated affords a considerable range of latitude, and a great diversity of soil. Its northern portion will yield the lighter wines, and the southern the heavier, while it can hardly be expected that many varieties of the grape will be valuable if they succeed at all throughout its entire extent.

The president stated that he had sent out circulars calling for statistics upon grape culture in the States embraced within the limits of the operations of the association. As yet only very partial returns had been made, Missouri having returned only about 667 acres, and Illinois about 687 acres in vineyard culture. These figures will be greatly exceeded by full returns.

J. M. Jordan moved that the president be requested to continue his inquiries till full statistics can be obtained.

Mr. Husmann stated that in Gasconade county from two to three hundred acres can be added to this.

Mr. Lazear gave 8 acres for Louisiana, Pike county.

An essay was then read by Dr. L. D. Morse, on Awarding Committees.

[The above valuable and suggestive essay was mislaid by some one into whose hands it has passed, and we regret to say it has not yet been recovered.—PUB. COM.]

N. J. Colman moved that the essay be referred to a committee to report the necessary action on it.

Adopted, and Theo. Engelman, George Husmann and C. W. Murtfeldt were appointed said committee.

Mr. Colman suggested that there were some points in the essay that should be discussed. He did not think that these premiums amounted to anything. The rank of the wines, the honor, was sufficient. These premiums came out of one set of pockets, and went into another set, who derived all the benefits.

Mr. Husmann said this is one view of the matter, but the rule works both ways. It applies with equal justice to all other exhibitions. I don't see why the same rule would not be equally good in both cases. Men are so constituted that they like premiums. All admire the *use* as well as the honor of the $1000 premiums awarded to horses, etc. I think the offering of premiums will bring more wine out to exhibitions.

Mr. Murtfeldt—I think the rule does not quite apply here. There is no entrance fee, so there is no fund for premiums. I believe, in the main, the premium is an incentive.

Mr. Husmann moved that Dr. Morse be added to the committee.

Passed.

N. J. Colman—There is a great distinction between the premiums as given at our county fairs and those given here. A man may exhibit a hundred articles and not want to part with one of them. There would be no objection if we had the funds, but there is no charge for coming here, or exhibiting here, and I think the exhibitor is well rewarded by the award.

Adjourned.

AFTERNOON SESSION.

Essay read by John H. Tice on

INSECTS INJURIOUS TO THE VINE.

The climate of America is peculiarly favorable to insect life. The amount of annual precipitation is about average of that in Europe; yet there it falls in about two hundred days, while in America the average of rainy days is about fifty for the growing season, summer, and twenty for winter. Insects like the sun and a dry atmosphere. Hence, in genera, species and number, the insects of America exceed those of any other division of the globe. However, the indigenous insects of America, like its aboriginal man and animals, have the peculiarity of perishing when brought in contact with the more vigorous races of the Old World. Some naturalists have advanced, as the cause of this, the hypothesis, that the American are of a lower and more primitive type. European insects that are parasitic upon any of our natives, exterminate both their congeners and the insect on which they are parasitic; hence, suggesting that, probably, the most effective way to make war upon our destructive insects would be to introduce their natural enemies and parasites from the Old Continent. Evidently in Europe there is, according to the law of compensation, a nearer equilibrium between dependent insect races than in America. The Hessian Fly (*Cecidomyia destructor*), for instance, is so controlled by a parasitic insect in Europe, that its existence was denied there until discovered by Mr. Dwight, of Connecticut. Since the accidental introduction of its natural parasite here, its ravages have very much abated, with the prospect that ultimately it will be so much checked, that here, as there, it will be comparatively harmless. In Europe, insect depredations bear no comparison to what they are with us. By far the most destructive insect is the Birken-Ruesselkaefer, the Birch-curculio (*Rhynchaenus, vel Curculio betuleti*). They commit much damage on the young shoots early in spring, afterwards roll themselves up in the leaves.

There are two species of snails which affect the vine in Europe (*Helix pomatia*) and (*Helix aspersa*), called respectively by the Germans, *Die Weinbergschnecke* (the vineyard snail), and *Die Rauke Weinbergschnecke* (the rough snail of the vineyard). They are both esteemed as great delicacies, and are prepared for the table in various ways. They are especially esteemed with salads and other vegetables. The latter is much valued as an article of diet for consumptives. They affect the vine in a similar manner as slugs, but do not much harm.

Of the Sphinges, there are three that depredate on the vine, *Sphinx porcellus*, *S. elpenor* and *S. celerio*, respectively called in German, *Die Kleine*, *Græste* and *Grose Weinschwaermer*—that is, the small, the largest and the large grapevine moth. The latter is also called *Der Traubenlecker*—that is, the grapevine gourmand. The habits of these sphinges is the same as their allied species with us, represented by the tobacco worm (*Sphinx Canolina*), and the tomato worm (*S. Quinque-maculata*), with this difference, that they feed on the grapevine.

In Europe there are two species of beetles of the genus Melolontha, to which also our May beetle (*Lachnosterna fusca*) belongs. One of them is the *Melolontha Julii, vel Frischii*, of Oken, named by the Germans *Der Weinblatt, oder Julius Kaefer*—that is, the grape leaf or July beetle; and the other is the *Anomala vitis*, which, sometimes in certain provinces of France, strips the vine of its leaves, though it prefers the leaf of the willow, poplar and apple. The *Procris vitis* does also much harm, some seasons, especially in France.

This seems to be about the extent of insect depredations on the grape in the Old World. As far as time permitted, I made an examination of history, to see if at any time the subject of insect depredations had attracted the attention of the ancients; but I was unable to find any mention of such depredations. The inference then, is that there were none, or if any, they were so insignificant as never to have been considered serious. This inference is strengthened by examining the Georgics. Virgil very minutely in the Second Book describes the culture of the vine, yet never mentions any insects as inimical to it. The aspect of the soil, its quality, condition, depth to be trenched, the time and manner of planting the vine, its pruning, training, tieing them to the elms,* cultivation, protection against severe winters, and powerful sun; weaving hedges so as to defend it against its enemies, such as "cattle, wild buffaloes, sheep, greedy heifers, the persistent vine-haunting goat, which is described as doing more injury than the frosts of winter, and the oppressive heats of summer, "scarring and poisoning with their hard teeth, the bitten stock," (hence the goat is offered as a sacrifice to Bacchus, the god of wine); all these are minutely elaborated, but no mention is made of insects, which certainly would not have been the case, if such depredations had existed to any serious extent.

Again, this inference is strengthened by the fact that Virgil, in the Third Book of the Georgics, describing bee-culture, mentions the bee-moth (*Tinea*), the spider, the light-avoiding blattis, (supposed to be the cockroach (*Blatta orientalis*), the hornet and the drone.

Nam saepe favos ignotus adedit
Stellio, lucifugis congesta cubilia blattis;
Immunisque sedens aliena ad pabula fucus,
Aut asper crabro imparibus se immisuit armis:
Aut dirum tinea genus aut invisa Minervæ
In foribus laxos suspendit aranea casses.

Georgica L. IV. 242.

[For often a skulking lizzard consumes the honeycomb, and its cells are filled with light-fleeing cockroaches; and the labor exempt drone sits at the feast of others, or the cruel hornet, with unequal arms, joins himself in battle with the bees, or the direful race of bee-moth, or the spider, so odious to Minerva, hangs the loose nets at the doors.]

From time immemorial, the vine has been cultivated, by all nations, whether barbarous, civilized, or enlightened, and amongst all of them, it has received the tenderest care and attention, and has been considered the nursling of the gods, and regarded as the most precious gift of heaven. Whatever attacked it, was considered an enemy of God and man. Hence, if the same insect enemies existed then, that trouble us so much now, we would have some mention and description of them, together with a history of the unintermitted war waged against them for four thousand years. We would have have a description of their character and habits, and the means and strategy to be employed to defend ourselves against them.

The European insects that infest the vine are not the same as with us; though some of them are species of the same genus. So far as this is the case, European experience is valuable to us for defending ourselves against their depredations. But unfortunately we have no catalogue yet of the vine-preying insects of America. Viniculture here, is comparatively a new business. It is hardly yet a quarter of a century old, for it cannot, properly, be said to have commenced, until we abandoned the foreign, and took up the cultivation of the native varieties. Foreign varieties were so delicate, and so diseased that we were more absorbed in studying their diseases, than in contemplating their insect enemies.

Longer experience is therefore necessary to determine the number and character of the noxious insects infesting the vine with us. Annually a new one, not observed before, is added to the number, so that now, as far as known, the number is as great and quite as formidable as those of any other fruit. We have insects that infest the root, the stock, the young cane, the leaf, the bloom, and the fruit. In fact, nothing pertaining to the vine is exempt from their depredations.

Before giving a description of these insects, I would state that naturalists have taken the wings as the discriminating characteristic of insects. Consequently we find that a modification of the Greek noun *Pteron, a wing*, in all the names of the *Orders*, as *Lepidoptera*, powder-winged; *Diptera*, two-winged; *Aptera*, without wings, etc. This will enable any one who will study these wing distinctions, to determine the order to which an insect belongs, provided it is the perfect insect. To assist in this, we in each case give a well known insect as the representative of the Order.

It must be borne in mind, however, that some insects undergo several transformations before they arive at the perfect state. In such cases, the perfect insect often is harmless while the period of its depredations is confined to its larva state, in which state they are only known and recognised by the majority of people.

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* See Appendix.

The following is an enumeration of the insects infesting the vine with us, and the Orders to which they respectively belong, as far as known to us:

ORDER—COLEOPTERA. (*Sheath-winged.*)

The May-beetle known to everybody by its depredations upon the young leaves, and the anoyance it causes by entering the houses after night, is a good representative of coleopterous insects.

First, the Spotted Pelidnota (*Pilidnota punctata*), is a large beetle with a dirty yellow wing-covers and thorax. It has two black spots on each side of the thorax, and four similar spots on each wing-cover in rows with those of the thorax. It feeds on the grape leaf during the day time. It can be pushed off by hand and destroyed, or fed to hens. Its larva are said to feed on the grape root. It is not very plentiful yet, but enough so to do much injury where there are only a few vines for it to operate on. It requires attention to keep it in check, before its multiplication has put it beyond control; second, the grape vine flee-beetle, (*Haltica chalybea*), is one-sixteenth of an inch in length, with purplish blue, or steel-colored shining wings. It appears early, eats holes in leaves and buds, hybernates in the ground at the roots of the vine, and feeds upon them; third the American vine chafer, or Light loving Anomala (*Anomala lucicola*), is about one-third of an inch in length, in form, resembles the May-beetle. Head and thorax of the male are greenish black; of the female, clay yellow, or tile red. Very destructive to the vine in the Eastern States, not plentiful in the West yet, and should not be suffered to obtain a firm foothold with us; fourth, the rose-chafer (*Melolontha subspinosa*), is one of the worst scourges to the garden, nursery and vineyard wherever it has appeared, attacking at random various kinds of plants, in such swarms as to commit the most extensive and deplorable ravages. It has already an extensive foothold in the West, though for a long time confined to the Eastern States.

Its depredations on the grape vine consists in devouring the bloom. The Dragon flies (*Lebellula pulchella*) are its natural enemies, seizing and devouring them with the utmost avidity.

Fifth. The Grape Curculio (*Coeliodes inequalis*), like the Plum Curculio, stings the fruit and causes it to be wormy. Its size, from one-tenth to one-eighth of an inch. It is rapidly on the increase in our region, and its ravages are truly formidable. The larvæ are half an inch long and of a bluish-gray color.

ORDER—ORTHOPTERA. (*Straight-winged.*)

The grasshopper is a good representative of orthopterous or straight winged insects. There are no orthoptera that are specially destructive to the grape, although there are several species of grasshoppers, especially the Red-legged Locust (*Acrydium femur rubrum*) that eat the stems of the bunches in this way. Sometimes they, also, like the wasp, eat the ripe berries (*acini*), but generally the fruit ripens too late for them.

The Mantis religiosa, the Praying mantis, belongs to this order. It is called by the Germans *Gottesanbeter*, and by the French *Prie Dieu*, that is, God worshipper, from its habit of holding its fore legs with which it seizes its prey, like a person in the attitude of prayer. We, Americans, more irreverently call it the devil's horse, or rear horse. Everybody ought to know it and protect it. It is predacious, living entirely upon insects, and is harmless, though many people have an aversion to it. It is the only insect that can be tamed by man, coming and taking from the hand, flies or other insects, and even fresh meat.

ORDER—HEMIPTERA. (*Half-winged.*)

This order may be represented by the Squash bug. It embraces some of the greatest scourges in the insect world; as the chinch bug, bark lice, plant lice, squash bug, vine hoppers, etc.

Of this order, the most noxious in affecting the vine, is the Thrips, or vine hoppers, (*Tettigonia Vitis.*) There is another called the red-veined vine-destroying leaf-hopper (*Erythroneura vitifex*), which, I think, is only a variety of the former, differing only from it in the red veins of the wings, as they are often found inhabiting the same vine together.

These insects are at first unprovided with wings. They cast their outer skin several times, and attain their full size about the beginning of August, by which time the leaves are covered with the cast-off skins of the insects. They live on the underside of the leaf, suck its sap so that the leaf turns yellow, and finally assumes a blotched or scorched appearance. When disturbed they hop, or take wing in such numbers as to fill the air. It also affects the vines in graperies, where it can be destroyed by fumigation with tobacco.

The Aphidians, or plant lice, live by sucking the sap of young and tender shoots; hence, the scientific name *Aphis* applied to the genus signifies in Greek, exhausters. The vine plant louse (*Aphis vitis*), is often very destructive to the young vines. The vine bark louse (*Leucanium vitis*), is not yet very plenty, like its congeners affecting other plants, as the apple bark louse, the pear bark-louse, etc., but it must be carefully watched and kept from multiplying.

Dr. Fitch describes a species of grape leaf plant louse (*Pemphigus vitifolia*), which, I believe, has not yet made its appearance in the West.

The grape leaf gall insect (*Dactylosphaera vitifolia*), is the insect that galls the leaf of the Taylor's, Clinton, and other varieties of the forest grape (*Vitis cordifolia*) variety. It is a mooted point amongst entomologists whether it is a Coccidian or *Aphidian*. I have never seen the perfect insect, though my Taylor vines have, for several years, had their leaves filled with galls. The Clinton and four other varieties of the frost grape species, have not, so far, been affected with it in my vineyard. Its scientific name is also unsettled yet. I have given that of Dr. Fitch.

ORDER—LEPIDOPTERA. (*Scaly or powder winged*).

The butterfly may be taken as the representative of this order. To this order belongs the Leaf-folder or Spotted Sable (*Desmia maculalis*), which a few years since, threatened the entire destruction of the vine in the west. The perfect insect is a small moth, of a dark color, with two white spots on the upper wings. Its larva is the leaf-folder, a light-green worm that folds the leaf and eats the parenchema. When disturbed it wriggles out and drops on the ground, where it feigns death. Hence, they can be driven on the ground and killed by pouring hot water, with a watering pot on them. After committing its ravages for one year (1865), from some cause, and much to the gratification and relief of grape growers, it has gradually decreased. It probably was an exotic, first appearing in a grapery at Atlanta, Ga. My own observation satisfies me that it met with a parasite, to which we may perhaps attribute its gradual decrease.

The American Procris or Forester (*Procris Americana*), is nearly allied to the Vine Procris or Vine-eating Procris (*Procris vitis, vel P. Ampelophaga*) of Europe. The perfect insect is a black colored moth. The larvæ are gregarious caterpillars, and live and feed together, side by side, on the same leaf. Specimens have been sent me from Bunker Hill, Ills., and from Rolla, Mo.

The Grape-root Borer (*Ægeri polistaeformis*) operates, like the Peach-borer (*Æ. exitiosa*), by eating the crown of the roots. Its first appearance was noticed in Stanley county, N. C., about 25 years ago, where it was destructive to all kinds of grapes, except the Scuppernong. It is gradually working its way westward, has reached central Kentucky certainly, and is reported to have been observed in Southern Illinois, and various points in Missouri. Remedy—remove the soil around the crown, and give a good drenching of boiling water. The moth is fully described in Patent Office Agricultural Report of 1854.

The Vine-dresser, or Hog caterpillar (*Chaerocampa pampinatrix*) resembles somewhat the tomato worm. It is pale green at first, but at maturity is somewhat copper colored. It has the peculiarity of retracting its head under the skin. It is voracious in its habits, eating indiscriminately every thing green on the vine, cutting off leaves and the stems of the growing fruit branches. The perfect insect is a Sphinx moth, which, like its congeners, comes out at evening and morning twilight to sip nectar in the flower garden and to deposit its eggs.

The gartered plume of the grapevine (*Pterophorus periscelidactylus*) is a pale-green worm, half an inch long, that rolls itself up in a ball of grape leaves.

The Eight Spotted Forester (*Alyphia octomaculata*), is a small worm, but when fully grown one and a quarter inches long, marked with alternate fine rings of white and blue, giving it a light-blue color. It feeds on the young buds and leaves. The moth is dark colored, with eight yellow spots on the wings, those on the fore wings quite large.

There are several species of the ordinary cut worms, that will climb during the night, the vine as well as other plants, and cut off the young shoots. They are the larvæ mostly of night moths.

ORDER—HYMENOPTERA. (*Membrane-winged.*)

The bee represents this order of insects. It embraces but few insects that are injurious to the vine. It however includes the vine saw fly, or grapevine slug (*Selandria vitis*); which is quite formidable, though not yet plentiful. It feeds in companies of a dozen or more beneath the leaf. The perfect insect is a fly about one-fourth of an inch long.

The wasp belongs to this order and in some places has been troublesome by its habit of piercing the fruit. This order contains a larger number of beneficial insects than all the other orders; to it belong the ichneumon flies, and other parasitic insects.

ORDER—DIPTERA. (*Two-winged.*)

This order embraces the most annoying insects to man and animals, such as the bot-fly, gnats, mosquitoes, flies, etc. Their larvæ may be considered, generally, as scavengers, consuming filth, carrion, and decaying or decayed vegetable and animal substances; though a few consume living vegetables, as the Hessian fly (*Cecidomyia destructor*), and the Gooseberry midge (*C. grossulariae*). As far as I know none of the order affect the vine.

ORDER—NEUROPTERA. (*Lace-winged.*)

The Dragonfly represents the order of lace-winged insects. This order has no interest to grape growers, except as embracing some of the most useful families of insects. The neuroptera are nearly all cannibals that prey upon other insects. The larvæ of the species embraced in this order, generally live in the water and undergo their transformation there.

APPENDIX.

In the preceding essay reference is made to Virgil, who devotes one book of the Georgics, Book II., entirely to the vine. I have since been informed, by the Rev. Mr. Peabody, that at Mantua, Virgil's native city, the practice of tying the vines to the elms, as sung by him, is still in vogue. To vine growers, a description of a vineyard two thousand years ago, cannot but be interesting and suggestive. At least, so it was to me, when, after a lapse of nearly half a century, I turned to re-read the immortal Mantuan bard. Therefore, supposing others might derive the same pleasure as myself, by seeing a description of an ancient vineyard, and the method of its cultivation, I extract such portions of the original as are necessary to give a vivid sketch of vine culture, as practiced in the poets time. These I translate, as nearly literal as possible, for those who do not read Latin:

Quid faciat laetas segetes, quo sidere terram
Vertere, Maecenas, ulmisque adjungere vites,
Conveniat, * * * * *
Hinc canere incipiam.

Georgica, Lib. I. 1.

[What makes joyful cornfields; under what star is it proper to turn the soil, and to tie the vines to the elms, O Maecenas, I here begin to sing.]

Seminibus positis, superest deducere terram
Sæpius ad capita, et duros jactare bedentes;
Aut presso exercere solum sub vomere, et ipsa
Fletere luctantes inter vineta juvencos;
Tum leves calamos, et rasae hastilia virgae,
Fraxineasque aptare sudes, furcasque bicornes:
Viribus eniti quarum, et contemnere ventos,
Assuescant, summasque sequi tabulata ulmos.

Georgica, Lib. II. 354.

[The shoots being planted, it remains to draw often the earth to their heads, and to apply the hard, double-toothed hoes; (Is not this the *'Karst'* of the German's?) or to stir the soil with the hard pressing ploughshare; and to guide the struggling bullocks among the vine-rows themselves; then turn, prepare and fix to them smooth reeds and poles of peeled rods, and ashen stakes, and bifurcated branches, by whose aid they may accustom themselves to climb, and despise the winds, and to follow the spreading boughs through the highest elms.

NOTE 1. *Tabulata*, has no English equivalent; the nearest to it is scaffold. To conceive then, that the outer boughs of the elms are serving as a scaffold for the vines, is the nearest idea implied by the term *tabulata*.

NOTE 2. The foregoing extract describes the treatment of the young vine. The future treatment is thus described:

Ac dum prima novis adolescit frondibus aetas,
Parcendum teneris: et dum se laetus ad auras
Palmes agit, laxis per purum immissus habenis,

Ipsa acie nundum falcis tentanda; sed uncis
Carpendae manibus frondes, interque legendae.
Unde ubijam validis amplexae stirpibus ulmos
Exierent; tum stringe comas, tum brachia tonde,
Ante reformidant ferrum; tum denique dura
Exerce imperia, et ramos compece fluentes.

Georgica, Lib. II. 362.

[And it is (to our interest) to spare the tender vines while in their first age, they sprout with new leaves; and while the joyful vine raises itself to the skies, rushing forth with loosened reins through the pure air, the edge of the knife itself is not to be tried; but the green boughs are to be plucked, and to be selected with curved hands. Then when they have gone forth and are now embracing the elms with their strong canes, strip their leaves, then trim their branches with the hitherto dreaded knife; then, finally, exercise severe authority, and restrain the flowing branches.]

The election of officers being next in order,
The President appointed Mr. Riehl, teller.
The result was as follows:

President—Dr. C. W. Spalding, of St. Louis.
Vice-President—George Husmann, of Hermann.
Secretary—Wm. Muir, Fox Creek P. O., St. Louis county.
Treasurer—John H. Tice, of St. Louis.

An essay was then read on

THE VALUE OF THE NEWER VARIETIES OF GRAPES FOR WINE.

BY GEORGE HUSMANN, OF HERMANN, MO.

You have induced me to undertake a pleasing yet difficult task. Pleasing, because of the vast strides in improvement made within the last five years, by testing new and superior varieties; because you invited me to mount that peculiar hobby of mine, which I have been riding harder, perhaps, than most of you, and because I can speak to you of *successful* experiment—can prove to you by word and evidence that we are destined to be the first wine producing country on the face of the globe. But also difficult, because among the many good varieties I can name to you, you would doubtless wish to know which is *best* and because I am as yet unable to answer that question, either to my own or your satisfaction. The samples I have made, so far, have been so small, and necessarily imperfect, that I can judge only from what they are now to what they will be, if made in larger quantities. I will let them pass in review before you, and to do so somewhat systematically, have classified them so as to compare with the leading or more general classes of foreign or imported wines. Of course, my observations are but local, mostly confined to those varieties which I have tried myself, but permit me to say here, that in quality, according to my judgment, the latitude of our State is, to the best of my knowledge, destined to out-rank most of her sister States.

CLASS I—WINES RESEMBLING HOCK, OR RHENISH WINES.

The Delaware—In quality this takes the lead of any we have yet in this class. Its wine, if properly made, is crystal color, of great body, excellent aroma, and in a few years, when made in larger quantities, can fearlessly enter the lists with the celebrated Johannisberg, Steinberg, or Cabinet, or Forster Traminer. It resembles the latter perhaps more closely than any other, so much so that a great many of our German vintners still think that is either the Traminer or a seedling of it. I think it is a true native—one of the æstivalis, or summer-grape class. It cannot as yet be recommended for general cultivation, as it is, in most localties, a slow and feeble grower; but whoever has a piece of rich sandy loam, with good natural drainage, on a high hill, should try the Delaware. I am inclined to think that a northeastern, or even northern slope, will suit it best, as its foliage is very delicate, and apt to blight and scorch. Should be pruned short, as it is apt to overbear. Its wine, I think, is likely to improve by age, but I have never been fortunate enough to taste a sample older than one year. The fact is it drinks too well to last long. Specific gravity of must, from 105 to 110 deg. in our neighborhood.

The Taylor—This also makes an excellent white wine, and many prefer it even to the Delaware. It is a strong and rampant grower, but seems to bloom imperfectly, and not to set well.

This may be remedied by planting Clintons, which bloom at the same time, among them here and there, and those who have planted it would do well to try this. Its foliage is also subject to depredations of the gall louse, and, in consequence of it, sometimes drops prematurely. Its wine has great body and peculiar flavor, strongly resembling some kinds of Rhenish wine, and will, without doubt, improve by age. It is of a clear straw color. So far, it cannot be recommended for *general culture*, although it makes too good a wine to be given up without further trial. Specific gravity of must, 100 to 105 deg.

Rogers' Hybrid, No. 1—This promises to be one of our most valuable wine grapes. Uniformly healthy and productive, as it seems to be, it furnishes a wine which will be an excellent substitute for the long suffering and failing Catawba, being about the same body, but more mild and of a more pleasant flavor. I predict a great popularity for the vine, as well as the wine, among our grape-growers and wine-drinkers. So far, *No.* 1 in *every* respect, with me. I made forty-five gallons of wine from about thirty bearing vines last fall, which is among the best I have in my cellar. Specific gravity of must, 78 deg.

Rogers' Hybrid, No. 9—This is also an excellent wine grape, and will make another good substitute for the Catawba, which it much resembles, but has been, so far, healthy and productive. It will make a better wine than Catawba, and more of it, as far as I can judge from a sample of two gallons made last fall from two bearing vines. Specific gravity of must, 80 deg.

Herbemont—This has already become an established fact, and although the vine has some drawbacks, as it will only succeed well in dry, warm exposures, and it is not quite hardy, yet where it finds a congenial soil it is one of the most productive and healthy, and no grape-grower worthy of the name will begrudge so excellent a variety the slight labor of covering. It makes a delicious white wine if the grapes are pressed immediately, perhaps more closely resembling the Rhenish wines in flavor than anything we yet have. Should be planted by every one who has the suitable soil for it. Specific gravity of must, 94 deg.

Cassady—This grape makes an excellent white wine, and is very productive, but somewhat subject to leaf blight. The hot sun of our summers seems to be too much for its foliage, and it may be advantageous to plant it on northern or northeastern exposures, which generally have deeper and richer soil. It is not subject to rot or any other disease, except this leaf blight, and may yet, by observing the above hints, become very valuable in the hands of our grape-growers, as it *always* makes a good straw-colored wine, which sells readily. Specific gravity of must, 96 deg.

Maxatawney—From a small sample of only a single bottle, made at this season, I am inclined to think well for wine of this, our most valuable and delicious white grape for the table. It is vigorous, healthy and hardy, and also seems to be productive. My acquaintance with it is of but short duration, but I think it will prove equally valuable for wine and table. No vineyard should be without it. It is a long way in advance of the Rebecca in quality, and will produce five times as much. Specific gravity of must, 82 deg.

CLASS II—WINES RESEMBLING THE WHITE HUNGARIAN WINES.

Martha—This is perhaps the most valuable grape for white wine that we yet have. A seedling of the Concord, it has inherited all the good qualities of its parent, but makes a wine much superior, of a clear straw color, of good body, and delightful aroma. I made only two gallons last fall from two bearing vines, and it has far surpassed my expectations, although I always thought well of its wine-making propensities. It is healthy, hardy, and very productive, and will, as I think, grow almost anywhere. I have never seen a rotten berry on it during the three years I have had it bearing; hangs well on the bunch, and keeps well. Even if Mr. Miller had never done anything else for the cause of horticulture than to introduce and originate this grape, his name would be kept in grateful remembrance by the grape-growing public; and I predict that the acres devoted to its cultivation will yet be counted by the thousand, as soon as the plants get low enough to bring it within the reach of the general planter. Specific gravity of must, 92°.

Cunningham—This, perhaps, should stand at the head of this class, as I think its wine equal in rank here to the Delaware among the wines of this class. It makes a heavy, spicy wine, which is "a mouthful" of fragrance and spirit. In habit the vine resembles the Herbemont, is about equally hardy, and needs the same soil and location. It is one of the latest ripening varieties, and valuable only to this latitude and further south. It has not failed to give me good, regular crops for the last four years, with covering in winter, and surely makes one of the choicest wines we grow. Should receive more general attention than it has had so far. Specific gravity of must, 112°.

Rulander—This is not, as is so often supposed, the German grape of that name, but is, I think, a southern native, belonging to the same class as Cunningham and Herbemont. It makes a very fine wine, although, I think, not quite equal to the Cunningham, and not so much of it; but it is healthy, and sure to bear, say a quart to the vine. Specific gravity of must, 110°

CLASS III—RED WINES RESEMBLING BURGUNDY AND PORT.

Cynthiana—This is, beyond doubt, the finest red wine we now have. Of the same body as the best Norton, it is much more delicate and spicy than this old favorite, and, while its medicinal qualities may not be so great, it will find more general favor with the wine drinkers. The vine is uniformly healthy, a strong grower, and of the same habit as the Norton's Virginia, which it so closely resembles that there is great danger of imposition, and those who wish to obtain the *true* Cynthiana had better be careful that they get it from a reliable source. Specific gravity of must, 118°.

Norton's Virginia—This is too well known to need more than a mention here, and still holds its own among our vine-growers, who have given it a warm place in their affections. It perhaps resembles Port even closer than Burgundy, and is growing old, but not cold, in our affections. Specific gravity of must, 115°.

CLASS IV—RED WINES RESEMBLING CLARET.

Creveling—A small sample of wine made from this grape has given me a very high opinion of its quality for wine. It supplies a want long felt among the wine-drinking public—of a wine intermediate in body between the Concord and Norton, and of a more delicate flavor. It resembles the choice Clarets of France with perhaps not so much astringency, and will, I think, soon become very popular. The vine has proved healthy and hardy with me; is not a very strong grower, and may be planted 6 by 6 feet. Seems to be very productive. Specific gravity of must 88°.

Clinton—This also makes a good claret, and although a very old variety, has not, until quite recently, been used much for wine. Its peculiar frost-grape flavor is not as agreeable to me as the pure flavor of the Creveling, though many may like it. It is a fair producer, and if we had no Concord the Clinton would no doubt be very acceptable. But the Concord yields more, is easier to manage than the Clinton, and its wine is, I think, equal if not superior.

Ives' Seedling—I cannot speak from experience in regard to this variety, as I have never made wine from it, and although I have tried a good many samples made in Ohio, I have been unable to accord it the high rank our Ohio friends claim for it. It has a pleasant flavor, but a great deal of acidity and harshness—an *unripe* taste, if I may so express myself—which is not at all pleasant to me. Perhaps by gallizing judiciously, a better wine may be made from it than I have yet seen. So far, I can see nothing which should induce me to prefer it to good Concord, and it certainly does not, from all I can learn, produce as much per acre. I shall make wine from it this season, and should be very happy to be able to change my opinion of its merits as a wine grape.

CLASS V—MISCELLANEOUS.

This class comprises all the independent spirits among our natives—those which I can hardly compare with any foreign varieties I know. The Concord would properly come into this class, though it may have some resemblance to some of the red Hungarian wines. It certainly does not resemble claret, as many seem to think, either in flavor or astringency. But it hardly belongs here. It has grown old, though not stale, among us; everybody plants it, and a great many love it. It is *the* wine for the masses, destined to become the every-day drink of the sturdy laborer, and will always, as such, retain a warm place in my affections. I may remark here, that for an every-day drink—a life and health-inspiring gentle stimulant, when I am at work—I have found none better suited than the Concord. Therefore, long may its sturdy foliage wave, and its juice inspire new life into the tired and flagging arms of our hardy and hard-laboring mechanics and farmers.

Hartford Prolific—This, if well made, resembles the Concord closely, and although hardly a true *wine* grape, can still be made into wine advantageously wherever it cannot be marketed very well. It makes a fair red wine, which no one who tries it can mistake for anything but a true native, and belonging to that class which Dr. Grant would call "offensive to a refined taste." But every one is not so superfined as the worthy Doctor, and I have seen those who thought the Hartford good enough for anybody. I would not plant it for *wine-making*, but those who have planted it for market need not fear that they cannot sell it were they compelled to make it into wine. It is productive, healthy and hardy. Specific gravity of must, 75°.

North Carolina Seedling—This is another very decided native gentleman, who could, perhaps, be *Muscatel*. It has a peculiar flavor, which has met with universal favor, and, if properly made (*i. e.*, strongly gallized), is certainly a delightful wine. The vine is one of our strongest growers, should have room enough, and long pruning, and will, if thus treated, produce enormous crops. But the advocates of "pure grape juice"—those who hold up their hands in holy horror at the idea of adding such a dangerous thing as water and sugar to the juice—need not plant it for wine, for I do not think they would find the "pure juice" of it very palatable. "A word to the wise suffices." Specific gravity of must, 84°.

The new seedling of Mr. Langendorfer—This has not even a name yet, but I have watched it closely and with a great deal of interest for the last three years, because I think it will make an American Madeira, something which we have long wanted, and every season confirms my belief in the value of the grape. It is a seedling of the Norton, of the same habit, and with the hardest wood I have yet seen in any native; very difficult to propagate, free from disease, and enormously productive. The bunch is long, narrow, and compact, shouldered, and the main bunch has somewhat the shape of an ear of corn; berry about the same size as Norton's, black, about as juicy as the Norton, but the juice is not red, but will make a brownish yellow wine, of great body, very fine flavored, and inclined to improve by age. For our latitude, and further south, I think it will be a great acquisition indeed, as far as I can judge from the small samples of wine which Mr. Langendorfer has yet made. This fall he will make a cask of the wine of at least forty gallons, and I hope and trust will add an American Madeira to our list of native wines. Specific gravity of must, 109°.

I may be expected here to say something about the Diana and Iona, and their value for wine. They may be valuable enough when you can get them, but I confess I have never been able to do so, and I am not given to speculation on the value of grapes so refined that they are beyond my reach. A favored few may have localities where they can grow them, but I am afraid they will be like angel's visits, few and far between. To those I leave the task to hold forth their merits to *their* admiring public.

Among the varieties which I think promise well for wine, but of which I have not made any as yet, I will name a few which I think worthy of special attention and trial—Alvey, Devereaux, Louisiana, Arkansas, Rogers' Hybrids, Nos. 3, 4, 12, 19, and Telegraph. I have faith in each of them as making a superior wine.

In summing up the evidence, perhaps you would like to know which among the varieties I have just reviewed, I would most largely plant. My first choice would be Martha, Rogers' No. 1, Cunningham, Herbemont, Cynthiana, Creveling, North Carolina Seedling, and the unnamed seedling of Mr. Langendorfer. All the others I will also plant, but of these the largest number.

And now, gentlemen, if my task is but imperfectly done, yet you have the results of my experience—an experience of years of toil and experiments. And I may be allowed to point with pride, not to my humble efforts, but at the glorious soil and climate of our noble State, which has enabled us, within a period of little more than ten years, to show so long a list of wines, which may already fearlessly challenge the best products of Europe, the fruits of the skill and experience of thousands of years; and I, unassisted by any one, throw down the glove to any of the importers in this proud city (who affect to turn up their noses at our native wines, speak superciliously of their harshness, and say their tastes are too cultivated to drink our wines) to produce, in the spring of 1870, a larger and better assortment of wines from his cellars than I can put up against it. I challenge them, and invite you cordially to be present at the trial. The time will come, and is not far distant, when the wines of our country will take rank among the first and best on the face of the globe; and all you who help to bring about this glorious result can look back with just satisfaction upon the task accomplished.

Mr. Lazear—What one grape would you recommend for red wine?

Geo. Husmann—The Cynthiana.

The committee to nominate the Executive Committee, reported the following names for 1868:

Dr. L. D. Morse,
C. W. Murtfeldt,
J. M. Jordan,
E. A. Riehl,
Rev. Chas. Peabody.

The President appointed the following committees on wines:

Red—L. D. Morse,
A. Engelman,
B. F. Lazear.
Catawba—Theo. Engelman,
George Husmann,
Isidor Bush.

In answer to a question relative to new varieties for red wine, the President said:

The Cynthiana is probably the best grape for red wine yet introduced, but the plants are still too high in price for vineyard planting. Does not think so highly of the new seedling of Mr. Langendorfer, which I believe is a seedling from Norton's Virginia, and has been named "Hermann."

George Husmann—Wine from this latter grape has as yet been made in too small quantities to enable us to judge fairly of its quality. Has made wine from it last season that will prove better than any before shown.

Mr. Murtfeldt moved the following resolution:

Resolved, That to obtain the best results in wine-making, we recommend that the members of this Association try experiments in mixing varieties of grapes at the time of expressing the must, thus following the example of experienced wine-makers of Europe.

Mr. Husmann—Has tried this to some extent with Norton and Concord, and Herbemont and Norton. The results not quite satisfactory. Some, of course, will like them.

It may be advantageous with some varieties, but such experiments should be conducted with great care, and on a small scale at first.

J. M. Jordan—There is one thing in regard to wine-making worthy of notice. A large number get into the habit of tasting with their *noses* to get the bouquet. We will, in mixing varieties, lose the bouquet. I look upon this mixing with distrust.

Mr. Murtfeldt—I wanted to draw out the experience of wine-makers on this point. I understand that the best results are obtained by mixing the grapes before making the wine. That there should be a *skilled* manufactory of wines upon a large scale all will admit.

There are some who wish to make more wine than is grown in their own vineyards; they will work up the surplus of others. Doing it on a large scale, with good cellars, will be a benefit to all.

There is another question upon which we need light. Will our native wines improve by age, and which of them?

J. J. Kelley—Can see no harm in persons mixing grapes.

President—I think that caution should be used in mixing varieties. In Europe their grapes are all of one species, and the varieties are nearly allied, while we have several species that are quite distinct.

Can give some testimony as to wines improving by age. Have drank Delaware and Concord four years old, and found both of them excellent. The latter had been tried every year and steadily improved in quality, gradually losing the strong flavor peculiar to this wine, which is objected to by some persons. At the end of four years it was really a fine wine.

Mr. Husmann—As to keeping qualities in wine, there are but very few varieties that we can get any chance of keeping. Concord is much better at two years old than six months. So with Norton and Clinton, but we cannot keep them long enough to fully test this. If we try it they are tested and tested until they are used up.

Theo. Engelman—My oldest wine was made in 1859. We did not obtain more than 40 gallons, of which we have a few bottles yet, and it is very good. My other varieties are only two or three years old.

Mr. Husmann—I tasted wines of '55 and '59 in Cincinnati, and found them good.

J. M. Jordan called for an essay, by Mr. Samuel Miller, of Bluffton, on the propagation of the grapes.

Dr. C. W. Spalding, President Mississippi Valley Grape Growers' Association:

Your invitation to prepare an essay on the propagation of the grape might, I think, have been extended to some one more competent to do the subject justice; but since you have thought fit to request it of me, it shall be complied with.

The Grape.—One of our favorite fruits of its season, for the table, as well as possessing the properties of making the most healthful and delicious beverages allowed to man, has been cultivated since the deluge, in all countries where it succeeded, ever holding a high rank in the productions of the earth. At no time, however, has the cultivation of this noble fruit been held in greater esteem than at this very day.

No doubt this feeble effort at throwing a few rays of light upon the subject of its propagation will be read before an audience in whom there is as much knowledge, enterprise, and enthusiasm as ever was found in the same number of persons.

When I reflect on this it seems almost presumptuous in me to attempt any enlightenment. But of one thing they may all rest assured it is not gathered from books, but actual experience. The vine is propagated in so many various ways that it is hardly necessary to dwell upon them all, but will on the most expedient.

From Seed.—Take the seed from the fruit and plant at once, about three inches apart each way, covering about one inch deep. When winter comes throw some leaves or litter over the bed as a slight protection. In the spring uncover and pull up all weeds, as they will appear before the grape seed will come up. When six inches high give each one a little stake high enough to keep tied to during the summer.

Stake and label carefully the seed of each variety planted, as it will be a source of satisfaction to know the parentage of your pets. Cultivate carefully the first season, and in the following spring set them into well prepared soil, three or four feet apart each way; of course, cut back to proper length. There will be some coming into bearing the third year, others the fourth, and some feeble ones perhaps a year longer; but they should not be discarded on account of feeble growth, as there is many a stout, robust man at forty years of age, who was small and sickly for the first fifteen years of his life. We discard those with a little down on the under leaf as Mr. Longworth once said. Out of a number of seedlings raised by myself, one so feeble as to almost tire my patience, came into bearing the fifth year, and now bids fair to hold a place among the valuable white ones, (Macedonia).

Do not be discouraged at the first fruiting in case it does not please, as the clusters will only come to perfection about the third and fourth year's bearing. All this requires patience, but will in the end reward the laborer.

By Cuttings.—Trim the vines in the fall, dress up the cuttings in lengths from six to ten inches, according to the lengths of joints. Cut transversely just across below the lower bud, at right angles with the bud. Cut one-half an inch above the upper bud but parallel with it. Tie these in bundles of one or two hundred each with willow, or something that will not rot. Have a printed label, with copper wire, attached to each bundle, with the name of variety and number of cuttings plainly written thereon. This will save much vexation and perhaps loss.

Now, simply bury these bundles of cuttings in a pit; set on end one tier, just so as not to have the bundles touch each other; throw in and cover three inches with fine earth; then another, but not more than three on top of each other. Cover all over one foot and leave until spring. From the middle of April to the first May is the time to set them out, by which time the buds will be well swollen and the little roots protruding. For three successive years have I practiced this method with marvelous success.

In planting these cuttings I line off the ground three feet apart, cut out a sloping furrow deep enough to receive the cuttings, at an angle of about thirty degrees, lay the cuttings in two inches apart, with the top bud always uppermost and just even with the surface of the ground. Then with a hoe draw some fine earth in on the lower half of the cutting, treading firmly with the feet as you advance. Another follows after, filling up the furrow with loose earth, and leave a little ridge about one inch high over the top of the cuttings; keep clean and loosen up the soil occasionally through the summer, when success will be pretty certain.

Under Glass.—This is a place in which science has been brought to play a prominent part; yet with all the improved fixtures, and utmost care, there is sometimes trouble. Mold is one great trouble when a long spell of cloudy wet weather prevails. To guard against this, every house ought to have some pieces of flue or pipes that can be bared so as to cause a dry heat to pervade the house. This, with the help of air-slacked lime, charcoal dust, and flour of sulphur, mixed in equal quantities and dusted over where mold makes its appearance, will speedily cure it. But where this heating arrangement is omitted, and there is a leaky sash overhead, all the skill of the best propagator is set at defiance.

As to the modes of propagating under grass, it would be needless for me to attempt to give any detailed plans, yet I must not omit one process which has not been in use in this part of the country, to my knowledge. It is by layering in green wood—starting a plant in a pot, which should be pretty large and stand upon a bench or shelf low enough so as to bring its rim on a level with that of three inch pots on the level stage. When this vine has started, say one foot, bend over the shoot to the little pot filled with sand and mold. Pinch one leaf out, bend this down into the middle of it, and with a little peg fasten it, filling the pot up with earth. When it has grown long enough do the same thing with the next pot, but always leaving one or two eyes between for the upright shoot to come out of.

When this has been carried on to the fifth or sixth pot you can detach the new ones from the old plant close to it; but leave the young ones all together until you find the outside ones well rooted. Then cut these apart, setting the smallest ones aside to be gradually hardened off for fall, while the stronger ones may soon be forced into shoots also.

While this was going on, the stool plant, no doubt, will have shoots ready to be layered, which will be greatly augmented by the cutting off of the young vine. Thus, generation after generation can be taken from one good plant, and the progeny to add to the number. These plants carefully treated, gradually tempered to less moisture and heat and actually set out into open ground, will make as good plants of the same size as in any other way.

But to do this the house must be very close, a high heat kept up day and night, as well as a humidity almost amounting to saturation.

The number of plants that can be produced from one strong vine (started in winter), by the end of the season, is almost incredible. Many will say this is steaming it too fast, and this will weaken the constitution of the vine. Not a bit of it, if the thing is properly managed. I care not how a plant is grown provided the wood and roots are ripe, it is a healthy vine.

The idea of some people that vines raised, or even started under glass, are less hardy than those grown out doors, is sheer nonsense. The fact is, those started under glass have the preference, from the fact that they are usually better matured.

Another matter which I cannot omit here, which is the plan of using boxes instead of pots, thereby avoiding a great expense as well as saving much labor.

When the eyes have first been rooted, instead of putting a plant in each pot, let boxes be prepared, say eighteen inches or two feet wide, the proper depth, and of a length to correspond with the width of the forcing pits.

By this plan you can have many more plants in the same space, can harden off ready to set out just as easy as in pots; much easier carried to the outdoor beds, and with careful handling, can be planted with very little loss. I once set out 5,000, out of a hot-bed from which I had removed the sash for a few hours in the morning and evening at first; an hour longer the next day, etc., until they stood the full day's sun. They were taken up by the basket full, carried one hundred yards, and planted. Shaded simply by setting a board a foot wide on the south side of the row (the rows running east and west, of course,) for a few days. There was not five per cent. died.

Instead of throwing a kind of mystery around this thing of growing plants under glass, and frightening any one who has not a princely fortune from engaging in it on account of the expense, I think it is the duty of every one to help make as much plain sailing out of it as possible.

Grafting.—This mode of both increasing, as well as bringing into bearing soon, new varieties has not received the attention it should. One writes this way, another that, a third has another plan, and so on; so that a beginner hardly knows how to do or whose method to pursue.

For more than ten years have I practised it, of course, not always with success to my wish; but when I had the wood for grafting and the vines under my own care have usually counted on 80 per cent. to grow. Keep the wood for grafting in damp moss or sand in a cellar, as cool as possible without freezing. In the spring, as soon as the frost is out, clear away the ground about the roots three to five inches; choose a smooth place in the stalk, saw it off, shave smooth with a sharp knife; split or rather cut down a little slanting so as to cross the grain, insert the graft, cut in the usual wedge-shape, and tie tight around with strong twine. This tying I deem essential, even if the stock is strong enough to hold the graft firmly, as I have observed that when the growth commences the split has a tendency to part, leaving the graft loose. If the graft is strong, long-jointed, use but one eye; cut one-half inch above the bud and two to four below the bud.

If thin wood and short-jointed use a two-eyed graft. When the stock is an inch or more in diameter use two grafts, but under an inch one is sufficient.

Sometimes it occurs that there is a great knot in the root where the graft should be set; this is particularly the case with wild vines in the woods. In such case clear the earth away down to the roots, cut them all off, and insert a graft in each, tie well, earth up in all cases to the bud of the graft, then cover with fine leaf mold or saw-dust one inch thick. This latter is to avoid a crust that might prevent the eye from bursting through. By the root grafting you can sometimes dig out a whole nest of valuable vines in the fall, many will have emitted roots out of the graft also.

If some of the roots be small and the grafts large, wedge the root and split or cut a wedge in the graft, so as to fit; these are more likely to root from the graft than when the graft is wedged into the root.

Such is my confidence in grafting the vine, that I would rather pay a high price for a few grafts of a new variety than to get a rooted plant without any spare wood.

I could now show you, beneath the cliffs of Montgomery hills, as we call it, grafts grown two inches already, that were set some six weeks since.

Although I cannot be present at your meeting in St. Louis, in spirit I am with you, and if this should prove acceptable and add a trifle to the information of the assembly before whom it is to be read, then the writer will consider himself rewarded.

J. M. Jordan called attention to systems of propagation under glass that had a tendency to injure the fruitfulness of the vine.

The natural tendency in any plant is to produce and perfect seed. Any other way of propagating the vine than by seed weakens the vine, and impairs its powers of producing fruit and seed.

Propagation by green wood cuttings did this to a very marked extent. If you propagate from scions taken from young trees instead of bearing trees, they become later and later in coming into bearing till they don't produce fruit at all.

Upon Mr. Russell's place there are five acres of Concord vines. One thousand were propagated under glass, and the rest from cuttings of ripe wood. The thousand propagated under glass do not produce half the fruit the other vines do.

Mr. Riehl takes opposite grounds from this. Does not think there is so much evil in propagating from green wood. As to trees not bearing such has not been the case with him. In my soil green wood propagates better and bears earlier than the ripe wood. There is no difference where grown under glass if they are well managed and well developed.

George Husmann agrees with Mr. Riehl, and can speak with some confidence on this subject. Have Concord from layers of old wood, green wood, single eyes, and cuttings, and see no difference in their bearing.

We take wood of some varieties not larger than a straw, propagate under glass. Set out in the open ground and they grow 6 to 8 feet in a season.

J. J. Kelley was struck with the difference in the vines on the Russell farm.

Thinks it was an admitted fact that the natural way of propagation is by seed. Would consider that a vine that made a good growth of wood, would make a better vine than one that made fruit early.

J. M. Jordan.—There are many vines sent out that were not propagated with a view to fruit, but just to sell. The Russell vineyard was planted in 1864; it was in part propagated from vines that had not been allowed to bear. This portion was four years in coming into bearing. Now I can induce bearing in one year from a layer. Some are propagated for 40 generations without bearing fruit.

Mr. Riehl.—Were they good strong plants at first?

Mr. Jordan.—They had strong canes. The potato does not propagate itself from seed freely.

Mr. Reihl.—If the plants are ripe, good and strong, it is all the same to me. I want wood and roots well matured.

J. J. Kelley.—The first plants of Concord I had came from Mr. Knox. They were small plants. I grew a layer from each plant the first season in a row of 20 feet. The second year there was no difference between the layers and the original plant. I doubt if there is any difference at all in them now.

George Husmann.—It is not all the same to me how plants are propagated. I think "layers" the worst plants. They are not independent plants like a "cutting" or "single eye." They derive their nourishment in part from the mother plants. The roots are all formed near the surface, and if it is necessary to plant deeper the sudden change is like revolution, and it is sometime before they grow off freely. The single eye had its roots deeper. Another point against "layers" is they have large, prominent buds and strong canes, and the buds are apt to be rubbed off. A plant from a cutting has a number of eyes, and one or more can be rubbed off without destroying the plant. I have made some experiments with plants of Norton's Virginia. I selected 400 of the best plants from a lot of 15,000 Norton's layers. I also chose 150 of the best plants from single eyes and 200 of the best that I could obtain grown from cuttings. These were all planted together and had similar treatment. Of the layers ten per cent. failed to grow, of the cutting-plants three per cent. failed, while I lost none of the 150 single eye plants.

Mr. Riehl has lost fewer layers than any other kind of plants. There may be something in the soil in which I propagate, but my own experience is in favor of layers.

President.—Most of the speakers have lost sight of the point made by Mr. Jordan. It was not the mode of propagation to which he alluded, but the character of the wood employed. He objects to the use of wood, taken generation after generation from young plants which are not of sufficient age to bear fruit. This is Dr. Grant's practice, and I for one am of the opinion that it impairs the fruitfulness of the variety so practiced upon.

I agree with Mr. Husmann as to the character of the layers, and long ago when this subject was under discussion at one of the meetings of our State Horticultural Society, expressed views similar to those he has advanced.

My preference is decidedly in favor of plants grown from cuttings. They are ind-plants, having a proper balance between root and top, and in this respect superior to layers. In plants from single eyes the young shoot and the roots are compelled to rely in the early stages of their growth, upon the plant food stored up in a single node. Hence it is necessary to stimulate such a plant by manures and by bottom heat. Whereas the cutting having more than one node allows the young shoot to appropriate the food contained in one node while roots draw from another. I consider the cutting plant better than the layer on physiological grounds. In the layer we get strong canes, large buds, and comparatively feeble roots. Thus we have a plant out of balance. One of the reasons why Norton's Virginia is so hard to transplant successfully, is because it is usually grown from layers.

The point made by Mr. Jordan I consider well taken, and I agree with him in the opinion that propagating from year to year from young wood, tends to diminish the productive habit of the variety.

J. M. Jordan—I planted out 7,500 vines, and but 5 failed to grow. They were Concord cutting plants.

J. J. Kelley—I don't see any reason for *one* plant dying if planted well. I don't think that they can be called healthy plants, if left in the ground from fall till spring.

Geo. Husmann—This point is, perhaps, well taken. It might be traced to another source, imperfect wood, enfeebled by the atmosphere in which they were kept.

The following is the catalogue of wines presented for examination:

Two samples Concord '67, one sample Catawba '67, by J. J. Kelley, Webster.

Two sample Catawba '67, by Mr. Westfall, Hannibal.

One sample Catawba '67, one sample Isabella '67, by Charles Paffrath, Melrose, St. Louis county.

One sample Catawba '67, by J. G. Drohman, Ralls county.

Two samples Catawba '67, by B. F. Lazear, Pike county, Mo.

Samples Catawba '65–'6–'7, varieties of Red Wine '67, by A. Engelman, Shiloh, Illinois.

Adjourned.

EVENING SESSION.

The report of the committee on Red Wines was presented and accepted.

The question of holding a meeting in the fall was taken up and discussed.

Geo. Husmann—When the circular was issued and the first meeting held, it was the object of this Society to hold two meetings each year, one in the Spring and the other in the Fall. One to show old wines and the other new wines. So that those who wanted to sell their wines might do so. Now it seems it is almost impossible to raise the valuable premiums we at first proposed. I cannot see how these premiums can be done away with. We, in Hermann, have raised $350 for premiums. If we cannot make out all we would like, let us try, at least, to do something. It was said that $1,000 could be raised in this city for premiums.

B. F. Lazear—There is no means of dispensing with the Spring meeting when we hear it said that some wines are best when six months old. In fall we must have a meeting, if we want to sell our wine.

Geo. Husmann—The Spring meeting should be from the 5th to the 10th of April, if you rack your wines in the end of February.

J. J. Kelley—Some men say that the wine clears thoroughly in February, and that if it is racked later it loses strength and aroma. Out of 160 gallons I did not get one gallon of lees.

Geo. Husmann—Men are apt to be mistaken as to when wine is clear. It is only wine that shows perfectly clear against the candle light that is clear. In the sun you may see no lees, but still be enough there to bring the wine into a state of fermentation. Many of our small wine growers may like to dispose of their wine before fall. We started out as an independent body, because our wines and grapes could not get the attention they deserved at the meetings of other societies. I think we will give but little attention to the grape, if we do not keep up two meetings in the year.

Dr. Morse likes the idea of the two meetings.

Mr. Engelman—In the fall the early grapes only are in condition in September. October is the time for the best grapes to be in perfection. In September we may judge of the form and size of bunch and berry but not of its quality.

The time of the Spring meeting was changed to the first Wednesday of April.

And the Fall meeting fixed for the second Tuesday of September.

Adjourned to 9 o'clock to-morrow morning.

SECOND DAY.—MORNING SESSION.

Society met at 9 o'clock.

President Spalding in the Chair.

In the absence of the Secretary, Mr. Tice was elected Secretary *pro tem.*

Mr. Murtfeldt read the following report, which was accepted, the committee discharged, and the recommendations adopted:

REPORT OF COMMITTEE ON PREMIUMS.

The committee to whom the essay of Dr. Morse on "Premiums and Awards," has been referred, beg leave to report, that they recommend for adoption, as part of the rules and by-laws of the association the suggestions contained in the clear, comprehensive, and exhaustive essay, as follows:

1. It is desirable that liberal premiums be offered for the best articles of wine on exhibition, as soon as funds for that purpose can be raised, or the finances of the association will justify it.
2. The committees on wine to consist of not less than three nor more than five members, and separate committees to be appointed on the different classes or varieties of wine.
3. The scale of 100 be adopted to designate the comparative quality of wine; 100 being the standard of excellence. But the committee on wine shall not confine their reports to figures only, but may add appropriate explanatory remarks.
4. After the wines have passed the examination of the committees, they are to be submitted to the members of the association which may be present.
5. Exhibitors to be requested to state in gallons the quantity of wine on hand from which the samples are taken.

THEODORE ENGELMAN, Chairman.
CHAS. W. MURTFELDT.

Mr. Engelman brought the attention of the association to the practical injustice of the working of the taxation system of the general government toward the grape growers and wine producers. There is no department of agriculture where so much depends upon actual manual labor. The ground must be prepared by hand, the plants set, the stakes prepared and driven, the vines trained and pruned, the fruit plucked, and the wine prepared—all by careful hand labor. And yet we are required to pay heavy taxes upon everything we use, implements, materials, and the very clothing we wear, while all the protection we receive is a low ad valorem duty upon imported wines, which are invoiced at a very low rate. He had known of wines which were valued in Europe at $2 per gallon, to be invoiced at $1 and under. He advocated the justice of protection from the government on the same scale as the taxes on the articles used, so that wine making should be put upon an equality with other interests. To effect the object he moved the appointment of a committee to investigate the subject, and recommend the necessary action to secure protection to wine-growers. Mr. Murtfeldt seconded the motion, and it was adopted, the chair appointing the committee, as follows:

COMMITTEE ON PROTECTION.

Adolph Engelman, chairman; Theodore Engelman and Henry T. Mudd.

DISCUSSION ON GRAPES.

Mr. Jordan, from the business committee, moved to take up for discussion the varieties of vines, with reference to their valuable qualities.

The President said the subject was an important one, and the question was whether the Concord grape should continue to hold the high rank accorded to it, or whether some other variety was equally good.

Mr. Engelman thought the Concord was cultivated too extensively as a wine grape. He had seldom met Concord wine that he liked. The best is not a popular wine, and a second and third glass, with him, invariably produced the judgment that it was not a first-rate convivial wine.

Mr. Lazear thought the subject opened a very wide field. There are but few grapes in this country that will suit all localities. Climate and differences in soil had much to do with the success of any variety. There was one question that seemed not to be settled, and that was, to what age has Concord wine been kept pure? That is, without introducing anything of a foreign nature to preserve it. We have enough of the Concord for *market* purposes now, and if it is not the most desirable for wine, there was danger of too extensive cultivation of it. He would like information regarding the Taylor Bullitt.

Did not bear well with him, and it was a question with him whether the failure was local or general. Last year he only made one gallon of wine from three hundred vines. Some say the fault is that the blossom is imperfect and needed other varieties with it as fertilizers. It was a rampant grower, and tender, and he was in doubt whether to grub out a few to give place to fertilizers, or to grub out the whole.

Mr. Jordan, to give directness to the discussion, moved that the association recommend the Clinton as an excellent grape.

Mr. Engelman spoke of the Taylor Bullitt. Col. Hecker, of Illinois, told him that an examination by microscope showed that the male blossom was deficient, and to twine it with other varieties made it productive.

The President said there is no question about the defect in the blossom, and it is from too small a quantity of pollen. With the Clinton, the Golden Clinton, or any of this species, the Bullitt readily fructifies. There were occasionally staminate plants, and one of them will fructify a whole row. But with other varieties the result can be relied on.

Mr. Lazear seconded the proposition to recommend the Clinton.

Mr Engelman said the Clinton only produced a second class of wine, which might be better than the Concord, but did not compare with the Norton's Virginia.

Mr. Tice had had a satisfactory experience with the Clinton, although on a small scale. Wine from it, when the fruit had arrived at perfect maturity, without sugar, was fully equal to Norton's Virginia. It was an enormous bearer, healthy, the first to color, but the last to ripen. He had seen Mr. Mason gather them after the middle of October, and his opinion was it was generally gathered to soon.

Mr. Engelman said these facts were against it, as the early coloring subjected it to the ravages of birds. Some birds swallow the whole berry, while others will peck at the blackened berries with great rapidity, ruining many. This was a cause for gathering early, before it was ripe. The wine from the Clinton, as far as he knew, was of second quality.

Mr. Jordan did not think the Clinton specially subject to the ravages of birds. The long time required to ripen it was rather in its favor in this respect. Birds are good judges of fruit, and are not apt to eat sour grapes. It is therefore exempt from attacks of the birds till it gets to be sweet, and then it is so late the birds have migrated. It is a free grower and wants room.

Mr. Peabody had tested the Clinton when fully ripe, and the fruit was very delicious. It may be made a good market grape. He particularly enforced the profitableness of the Concord. Some feared that too many had been planted, but he did not. It was profitable at even the lowest price for wine, and the taste for grapes was yet to be created. He referred to the fact that even in New York city, twenty five years ago, there was very little market for strawberries. Now a taste has been created, and the demand and supply is enormous, and at very high prices. So it would be of grapes, and the Concord would find an increasing market every year. Those who had large quantities of them had no occasion to be scared. The Concord had a tender skin and would not keep long, and it had happened for a year or two that it had ripened just when the cholera panic set in, and people were afraid to eat them. A week or two later, and they would have found a ready market. But this evil was only temporary.

Mr. Engelman suggested that the Clinton was one of the earliest to commence growing in the spring, and grew out of reach of late frosts. The frost on the 6th of May, which injured other varieties, did not affect this, as it was so far advanced.

Mr. Eisenmeyer said it was a good grape if you got the right kind. But it deteriorated, and these vines were not worth anything. But the real vines produced fine fruit. He had had a sad experience with the Taylor Bullitt, but the wine from it was superior. The Concord is the variety for cheap wines, and cheap wines were the secret of making money in the long run. For general use we must make a wine to take the place of claret, and at a cheaper price. The more delicate and costly wines from more delicate vines, were not as remunerative, and for money he would say stick to Concord, Clinton and Norton's Virginia. He believed in enriching the ground, and renew ing it by manures, and related an anecdote of Marshall P. Wilder, who visited a stable in Germany where forty cows were kept, for the express purpose of supplying manure for grape vines. "Here," said the vine-grower, "is where Johannisberg is begun." We must do the same thing to produce the best fruits. Wine was put upon the market too soon. It is not wine at all till it is two years old; and it grew better from year to year. Before that age it was only *must*, and would ferment when the vines blossomed. There was force in the German Bible. Where Isaiah speaks of the "feast of fat things," with "vine on the lees," the German reading is, "with plenty of wine *without any sediment.*" That was the wine to have, and age only could produce it. He repeated, that wine under two years old was only unfermented *must*, and not fit to be sold or used.

The president acceded to what had been urged in favor of the Clinton, but suggested that its rampant growing required much laborious pruning, and the gall fly attacked it. It also produced too many bunches, yet yielded less wine per acre than the Concord or Norton's Virginia. He also discussed the age and the price of wines, and held that the Concord must compete with claret wines, and produce a wine at less than a dollar. Those who use claret do not like the Concord at first, but after a little use will not go back to claret. The safest variety now is Norton's Virginia. Its wine has medicinal qualities, and is the thing for autumn use, and indeed all the year round if one can afford it. This can be exported to good advantage, as was done last year, European connoisseurs deciding in favor of it, and also of Cynthiana. Another claimant for favor is the Ives, a native of Ohio. It had not been fully tested here, but anything heretofore that had flourished about Cincinnati had done better in this locality.

Mr. Eisenmeyer approved of the Ives, and said all our wines can be improved by mixing, either the grapes before making, or the wines after.

Mr. Jordan spoke favorably of the Ives, but said we wanted statistics as to quantity of wine from a given amount of fruit. It takes 17 pounds of fruit for a gallon of wine with Norton's Virginia, while Clinton would make one-half more, and Concord double. The Ives would probably do as much as the last.

Henry T. Mudd was called on. He had little experience thus far, but was planting largely—60,000 vines this year. Erom all his observations and inquiries he had adopted in equal quantities, Concord, Ives and Nortons. He thought the Clinton not uniformly healthy.

Other remarks were made upon soils, diversity of climate, and the impropriety of recommending any variety at the present time, when the motion to recommend the Clinton was withdrawn, as it had been made simply to elicit discussion.

REPORT ON CATAWBA WINES.

The committee on Catawba wines beg leave to report that the warm sultry weather is unfavora-to the exhibition of new wines of the last vintage; that in all the samples on exhibition, more or less traces of incipient fermentation were observed, and that in consequence thereof, a full and fair appreciation of these wines becomes more difficult and uncertain.

The committee were unanimous in their opinion, that the wines exhibited as Nos. 3 and 4, were the best samples of vintage of 1867. No. 4, clear, and of a remarkably deep Catawba color, was well developed and pronounced the best, while No. 3, closely resembled it and may surpass it in flavor, after attaining its ripeness. Next came No. 10, a very good wine, the distinction between these three samples in point of excellence being very small. No. 7 of a pale green color, was not acknowledged as Catawba wine, it being destitute of the well known flavor of that grape; it also presented a taste foreign to wine, derived probably from the cask or barrel in which it was kept. Nos. 8 and 9 were not sufficiently developed, and contained too much unfermented sugar, to be considered and judged as wine.

All the wines of 1867, on exhibition were gallized; those numbered 8 and 9, to an extent, which the committee cannot approve or recommend for imitation. Nos. 11 of 1866, and 12 of 1865, are wines in good condition and of good quality, the committee accord to them, on the scale of 100 the rank of 75.

The committee do not feel justified to class the new wines of vintage 1867, according to the adopted scale, because these wines are not sufficiently developed.

THEO. ENGELMAN, *Chairman.*

The committee on final resolutions made the following report, which was adopted excepting the last resolution:

Resolved, That the thanks of this association are tendered to the county court for the generous use of the comfortable and commodious room, free of charge, for holding our meetings.

Resolved, That the President is hereby authorized to draw upon the Treasurer for such amount as he may deem just to compensate the janitor for attending to our wants and keeping the room in order during the meeting.

Resolved, That when the Association adjourns it adjourns to meet at Hermann to-morrow morning at 9 o'clock.

The last resolution was objected to, because the association had transacted all its business, and was therefore ready to adjourn, that the trip to Hermann was to accept and partake of the hospitalities of its citizens tendered to the association, and that while it was desirable that all the members present should go, the Pacific Railroad Company having placed a car at their disposal; yet it should be more a trip to see our Hermann friends, instead of their vineyards and wine cellars, and learn what we could of the vine and its products, than with a view to transact business. The resolution was therefore laid on the table.

On motion, the association adjourned.

FALL MEETING

OF THE

MISSISSIPPI VALLEY GRAPE GROWERS' ASSOCIATION.

SAINT LOUIS, September 9, 1868.

Association assembled in circuit court room No. 2.

Dr. C. W. Spalding, the President of the Association, called the meeting to order at 11 o'clock A. M., and delivered a brief address, as follows:

Gentlemen of the Mississippi Valley Grape Growers' Association:

We are assembled to-day for the purpose of bringing together and comparing the products of our vineyards, gathered together from various parts of this broad valley. We come with our minds enriched by the experience of another season, and with our hands laden with the luscious offerings which appear upon the tables before us.

This extensive collection of superb fruits, comprising hundreds of plates, and in which I have already counted about thirty different varieties of native grapes, besides quite a number of foreign origin, affords you and the public a valuable opportunity for comparing varieties, and also of contrasting the different samples of the same variety, grown on different soils and under different modes of pruning and training.

It is the province of this Association to discuss, and, as far as possible, to determine, not only the varieties best suited to our own section of the country, but also to recommend to others the best modes of preparation and culture of the soil, of staking, trellising, pruning, etc., etc.; and in furtherance of these objects several of these topics will be brought before you for discussion at this meeting.

There is a growing interest all over this country in regard to the culture of the grape. The whole community are interested in the subject, either as producers or as consumers of both fruit and wine. A few years ago the consumption of grapes as a table fruit was almost wholly confined to the wealthy classes, for the high prices at which they were sold placed this luxury beyond the reach of the laboring man. It is a duty which we owe to the community, to give them cheap grapes in abundance. We must bring to our markets a cheap as well as a wholesome fruit. This we are already doing, and the day has now come when every man, however small his income, can afford to eat and drink of the health-giving products of the vine.

I have simply stated some of the objects which have brought us here on this occasion; and with an earnest desire that this meeting may prove both useful and interesting to those present, and that its deliberations may be beneficial to the public at large, I refrain from occupying your time with any extended remarks, but open the meeting at once for the transaction of its legitimate business.

The secretary, Mr. Muir, being absent, B. L. Kingsbury, of Alton, was elected secretary *pro tem.*

The president appointed the following committees to examine the different kinds of grapes on exhibition, and report:

ON BLACK GRAPES—W. C. Flagg, E. A. Riehl, J. J. Kelly, E. S. Foster, H. Clagett.

COLORED GRAPES—James E. Starr, Raphael Bush, Chas. Peabody, D. T. Jewett, B. F. Lasear.

FOREIGN GRAPES—Isidor Bush, Wm. Groshon, J. M. Jordan.

COMMITTEE ON SYNONYMS—Geo. Husmann, E. S. Hull, J. H. Tice.

On motion, new members were admitted for the remainder of the year at half price: one dollar.

On motion of W. C. Flagg, the following committee was appointed to report order of business, committee to report after dinner: E. R. Mason, W. T. Essex, Dr. B. F. Edwards.

Society then adjourned until 2 o'clock P. M.

AFTERNOON SESSION.

The committee on business made the following report, which was adopted:

REPORT OF BUSINESS COMMITTEE.

The committee on business beg leave to report the order of business for the Association, as follows:

1st. The subject as to the best mode of training the vine for general culture.

2d. The best varieties for general vineyard culture, either for wine or table.

3d. The subject of pruning at all stages of growth.

4th. The subject of propagating.

5th. The subject of soil, planting and culture.

E. R. MASON,
Chairman Committee.

The following reports were also received and adopted:

REPORT OF COMMITTEE ON FOREIGN GRAPES.

H. E. Bridge, of Glendale, exhibits Black Hamburg and Golden Hamburg, grown under glass; bunches of immense size, and flavor very fine.

D. T. Jewett, St. Louis, Black Hamburg, Golden Chasselas, Black Prince, Rulander, grown in the open air; bunches not as large as the same kinds from under grass, but quality of fruit very fine. The White Scotch Cluster, exhibited by Mr. Jewett, the committee decide to be the Golden Chasselas. White grape exhibited by Mr. Jewett, no name, decided to be the Allen Hybrid, and superior in quality to any other named above.

J. M. JORDAN,
ISIDOR BUSH,
WM. GROSHON,
Committee.

REPORT OF COMMITTEE ON BLACK GRAPES.

The following report was read from this committee:

The undersigned respectfully report that, having been appointed a committee to examine the grapes on exhibition, and instructed that they should pay attention to size of bunch, size of berry and quality of fruit, and report the specimens of first, second and third grades in order of merit, they entered zealously upon their duties, but owing to the members of another committee, engaged in the like pleasing process of tasting, without special care in replacing of bunches and labels, your committee have labored under great difficulty in distinguishing sorts, and probably have omitted some fine specimens altogether. The following are the conclusions arrived at, under such circumstances:

Of Concord, we find specimens from J. E. Starr, E. S. Hull, H. S. Christian, Kœnig & Gast, John H. Tice, B. F. Lazear, Cliff Cave Wine Company, E. R. Mason, J. M. Jordan, Geo. Husmann, John Valle, G. L. Ditch & Co., and C. H. Hinckler. We pronounce those of B. F. Lazear, of Louisiana, Mo., to be best; those of J. E. Starr, of Elsah, Illinois, second, and those of Cliff Cave Wine Company third. Those of J. M. Jordan and others are so nearly equal that the committee found it difficult to make a decision.

Of Norton's Virginia, presented by E. R. Mason, E. S. Hull, J. E. Starr, Geo. Husmann and C. H. Hinckler, we commend, as first, those of C. H. Hinckler, of Waterloo, Illinois; second, those of Geo. Husmann, of Hermann, Mo., and third, those of E. R. Mason, of Webster, Mo.

Herbemonts were shown by H. Paddleford, E. R. Mason, E. S. Hull, J. E. Starr and Kœnig & Gast. The best (and they are exceedingly fine) are those of H. Paddleford, of Carondelet, Mo.; second, those of E. S. Hull, of Alton, Ill.; third, those of J. E. Starr, of Elsah, Ill. Those of George Husmann are nearly equally good.

Clinton—Is exhibited by J. E. Starr, E. S. Hull, J. H. Tice, Geo. Husmann, E. R. Mason and C. H. Hinckler. The best are those by E. S. Hull, of Alton, Ill.; second by E. R. Mason, and third by Geo. Husmann.

Cunningham—Is shown by Geo. Husmann and Kœnig & Gast. E. R. Mason exhibits Long, of Ga., as a synonym. Of these specimens, those of Geo. Husmann are best; those of Kœnig & Gast second, and E. R. Mason, third.

Cynthiana—Is shown by George Husmann and C. H. Hinckler. Those of Mr. Hinckler are best.

Elsinburg—Is shown by George Husmann and E. R. Mason. Those of Mr. Mason are best.

Alvey—Is exhibited by E. R. Mason and George Husmann. Mr. Mason's are best, and the grape very fine.

Union Village—Is shown by E. R. Mason and B. F. Lazear. Mr. Lazear's are best.

Isabella—Is shown by George Husmann and James E. Starr. Mr. Starr's are best.

Israella—Is shown by George Husmann and E. R. Mason. Mr. Mason's are best, but not equal to Dr. Grant's opinion of it.

Blood's Black—Is shown by C. H. Hinckler and E. R. Mason. Mr. Mason's are best.

Rulander—Is exhibited by Kœnig & Gast and H. G. McPike. Those of H. G. McPike, of Alton, are the best. This grape is one of the finest in quality.

Mary Ann—Is shown by J. E. Starr and E. S. Hull. Those of Mr. Hull are best.

Creveling—Is exhibited by E. R. Mason, H. G. McPike and Geo. Husmann. Those of Mr. Husmann we rate first, those of Mr. McPike second, and those of E. R. Mason third.

North Carolina Seedling—Is exhibited by George Husmann and E. R. Mason. Mr. Mason's are best, if that word can be used with respect to this grape.

Single exhibitions were made of several grapes of more or less interest.

Mr. Mason exhibits Oporto.

Mr. John H. Tice exhibits Adam's Soulard, and probably other varieties, but these had been so much displaced that we could not judge of them.

George Husmann exhibits Hermann, a seedling of Norton's Virginia, not ripe enough for testing, five bunches. Roger's No. 19—Only good in quality. Baxter—Not ripe. Arkansas—Very good. Devereaux—Very good. Telegraph—Foxy, and only good. Louisiana—Best in quality, though small.

H. Paddleford exhibits Aikin—Only good.

The exhibition of grapes, though not as large as the scope of our organization should afford, is very fine in appearance and very excellent in quality, in spite of the late rains that have filled them with excess of water. And we trust that the grape-growers of the Mississippi Valley, encouraged by the abundant vintage of the season and the evidences of enlarged and varied culture here before them, will plant "a little more grape" the coming season.

W. C. FLAGG, *Chairman,*
H. CLAGETT,
E. A. RIEHL,
J. J. KELLY,
E. S. FOSTER.

GRAPES OTHER THAN BLACK.

The committee to whom was referred "Grapes other than Black," would respectfully present the following report:

They consider the exhibition as remarkable, both in number of varieties and uniform excellence of specimens. Even the most casual observer will be attracted by the beauty of the display, while the connoisseur will be able to gratify his tastes.

Those who look to the use of this fruit of all classes as an article of diet, and those who are seeking by the introduction of cheap and wholesome wines, to lessen the use of deleterious drinks, have found great encouragement.

The number of exhibitors is fifteen. Number of varieties examined by the committee, and the awards, are as follows:

The best specimens of Catawbas, B. F. Lasear, of Louisiana, Mo. Second best we were unable to decide between E. R. Mason, of Missouri, and J. E. Starr, of Illinois.

The best Delawares, B. F. Lazear. Second best, Geo. Husmann, of Hermann, Mo.

For best Diana, H. G. McPike, of Alton, Illinois.

For best Iona, J. E. Starr, Jersey county, Ill. Second best Iona, Mr. Paddleford, Mo.

For best Allen's Hybrid, Geo. Husmann.

For the best Rogers No. 1	Isidor Bush & Son.
" " " " 15	Mr. Paddleford, Mo.
" " " " 3	Geo. Husmann.
" " Maxatawney	Geo. Husmann.
" " Taylor's Bullitt	Geo. Husmann.
" " Cassady	Geo. Husmann.
" " Rebecca	J. E. Starr

The collection of B. F. Lazear embraced but two varieties, which, as will be seen by our report, were remarkably fine.

That of J. M. Jordan seven varieties, none of which were of great excellence.

That of E. R. Mason eight varieties, of which the Catawbas were very fine, while the remaining specimens were passably good.

That of J. E. Starr nine varieties. Catawbas very good; Rebeccas remarkably fine specimens, Taylor and Delawares both good. Collection as a whole very good.

Dr. E. S. Hull, two varieties, both good specimens.

H. G. McPike, Dianas only; best on exhibition.

Koenig & Gast, five varieties. The Delawares were good; the remainder fair specimens.

C. H. Haven, one variety.

J. H. Tice, nine varieties; generally medium in quality. Among them was one said to be a seedling of the Taylor, which we deem better than its parent.

Geo. Husmann, twenty varieties. The specimens were generally very good and creditable to the grower. Prominent among them were several to which were awarded the first rank.

Mr. Paddleford, five varieties; all well grown.

John Valle, a white grape, a seedling of Concord.

Your committee were frustrated in their examination of this, it having been tested by a self-constituted committee in so thorough a manner as to leave us no material to work upon.

Geo. H. Gill, five varieties; specimens of fine quality.

Chas. Hinckler, four varieties, of fine character.

In conclusion, we would say that the Catawbas exhibited were of uniform excellence and much better than usual. No disease has troubled the growers the past season, and those who yet cling to this old and well-known sort take courage when they meet with such results.

The Delaware, we find, is daily gaining favor with those with whom it succeeds.

We find a great many varieties of "grapes other than black," upon the table, some of great excellence, but which have not yet been generally cultivated to an extent that calls for any particular expression of opinion.

Respectfully submitted.

J. E. STARR, *Chairman*,
CHAS. PEABODY,
B. F. LAZEAR.

Discussion taken up in the order reported by business committee.

TRAINING VINES.

Dr. Edwards —I desire to hear from our friends in Illinois. I hope they will give us their experience with different modes of training.

Dr. Hull—I have nothing special to offer that I have not stated before.

To each vine I set three stakes—one at the vine and one on either side, two feet from the center stake. Thus each vine occupies four feet in the rows, leaving space between the vines for pruning, the circulation of air, etc. The stakes six feet six inches high; to the top of these nail a continuous slat or bar. To the center stake nail the ends of two laths, say three or four inches from ground; incline these upward say three degrees, and nail to the outside stakes. On these slats you are to train two branches, one on each, to and up the outside stakes. These young branches, on reaching the top of the poles, may extend right and left on the continuous bar first described. In pruning, both of these canes are to be cut back—one for fruit, to ten eyes, more or less, the other to three or four eyes. To the center pole was attached the cane that bore fruit; this is cut clean away, and the cane with ten eyes is twisted and wound spirally around the center stake and tied firmly to it. This is the cane that produces the fruit, and from its position is free from drip or shade from other parts of the vine. The spiral binding and twisting will cause the buds to break evenly, and its position secures full exposure of all its leaves. Both the pruning and training will be the same each year. On your fruit cane never grow two leaves where only one can be fully exposed; large fruit and color depend on full development of the leaves. Competition for sun and air will greatly lessen the value of your crop.

George Eisenmeyer—I have seen good success in training to stakes, but prefer trellis; think the foliage is too much confined on stakes, and does not admit of sufficient circulation of air. I do very little pruning after July.

B. F. Lazear—My plan is to leave a stake at the vine on which to train my new wood, and a stake each side on which I train my bearing vines.

E. R. Mason—My method is stakes until I get two arms, and then trellis. I don't think it possible to get the same quantity of grapes from stakes that you can from trellis. I am satisfied trellis is cheapest in the end and easier to manage. My vines are planted 8x8. My trellis is six feet high, and I have no trouble in filling the whole space with grapes. In 1866 I cut 11,000 lbs., 1867, 13,000, and I estimate the crop this year at 10,000 lbs. to the acre, Concord grapes.

J. E. Starr—I commenced the cultivation of the grape several years ago, and have been trying ever since to determine the best method of pruning and training. We are all in our infancy yet in regard to training the grape, and I think the proper way has yet to be determined. I prefer stakes for the reason that the vineyard can be cultivated both ways with horse power at much less expense than with trellis, and that the crop will be equal in quantity and quality to that trained on trellis.

E. R. Mason—Trained on stakes you have but two bearing canes, while I, on trellis, have six bearing canes.

J. E. Starr—I aim to produce uniform crops. I believe we can over-crop and destroy our vineyards.

E. R. Mason—As I said before, in 1866 I took 11,000 lbs. Several Germans said I would ruin my vineyard by over-cropping. I said I would show them the next season. The next year I cut 13,000 lbs. to the acre, all full and well developed bunches. I believe the Concord can be made to average 10,000 lbs. to the acre, and not hurt them. My method of cultivating is this: I have two men go over the vineyard in the spring with spades and turn over all the ground near the trellis: all the cultivation it receives afterwards is done with the cultivator. I do not cut out all my old fruiting canes, I find that I get more and better fruit on old wood.

J. J. Kelley—I have found that it is a matter of necessity, not of choice, that we fruit on old wood if we train with horizontal arms.

J. M. Jordan—I claim that mode of training is best which will take up the most light and sun. I train on slanting trellis, every square foot of ground on which the sun shines is so much lost; the idea is to so train that your vines will take all the sun and keep it from the ground. I had in 1866 from one-half acre of ground 11,000 lbs; in 1867—7,000 lbs, and will have this season about 8,000 lbs. I will guarantee to plant fifty Concord vines that will produce one hundred pounds each in four years. I manure my vineyard heavily, I calculate to put on three times as many pounds of manure as I take off grapes.

E. R. Mason—I hold that if you get the light of the sun it makes no difference whether you get the direct rays, so you get the solar heat it is all that is required.

DISCUSSION OF VARIETIES TAKEN UP.

Considerable discussion was had upon the different varieties as they were proposed which resulted in the following varieties being recommended for table and market in the order named: Concord, Rogers No. 4, Rogers No. 1, Hartford Prolific recommended for market only.

The following were recommended for table grapes only: Herbemont, Delaware, Creveling.

On motion, it was resolved to recommend four varieties for Red Wine, and four for White.

The following were recommended for Red Wine in the order named: Norton's Virginia, Concord, Ives, Clinton.

The President appointed the following committee on Wines: G. Hoeber, James E. Starr, E. S. Hull, Geo. Husmann, and Adolph Engelman.

The following is the list of wines on exhibition, 39 samples:

NO.	VARIETY.	MAKER.
1	Catawba vintage of 1866	A. Engelman, Mascoutah, Illinois.
2	" " 1867	" " "
3	Concord " 1866	W. T. Essex, Kirkwood, Missouri.
4	" (Amber) " 1867	J. J. Kelley, St. Louis county.
5	Catawba " 1867	" "
6	Clinton " 1866	E. R. Mason, "
7	Catawba " 1867	E. S. Hull, Alton, Illinois.
8	Norton's Va. " 1867	G. L. Ditch, Waterloo, Illinois.
9	Taylor " 1867	C. A. LaCoste, St. Louis county.
10	Clinton " 1867	" "
11	Norton's Va. " 1867	" "
12	Catawba " 1867	B. F. Lasear, Pike county, Missouri.
13	" " 1867	" " "
14	Isabella " 1867	" " "
15	Concord " 1867	" " "
16	Catawba " 1867	E. A. Thompson, Cincinnati, Ohio.
17	Rulander " 1867	George Husmann, Hermann, Missouri.
18	Roger's Hybrid No. 1 " 1867	" " "
19	Herbemont " 1867	" " "
20	Creveling " 1867	" " "
21	Delaware " 1867	" " "
22	Norton's Va. " 1867	" " "
23	Concord " 1867	" " "
24	Catawba " 1867	" " "
25	Cynthiana " 1867	" " "
26	Martha " 1867	" " "
27	Cassady " 1867	" " "
28	Delaware " 1866	James E. Starr, Eminence, Illinois.
29	" " 1867	" " "
30	Diana " 1867	" " "
31	Concord " 1867	" " "
32	Catawba " 1867	" " "
33	" " 1867	" " "

Six samples of California Wines, as follows:

No. 1 "Johannesberg" and "Franken" Reissling vintage, 1866, Dr. Geo. D. Crane, St. Helena, California.

No. 2 Mission Grape, vintage, 1862, Dr. Geo. E. Crane, St. Helena, California.

No. 3 " " " 1866, " " "

No. 4 Black Malvoise " 1866, " " "

No. 5 Mission " 1863, " " "

No. 6 Chasselas and Gray Malvoise, vintage, 1865, Dr. Geo. D. Crane, St. Helena, California.

Society took a recess till evening.

EVENING SESSION.

After calling the meeting to order, the President stated that nominations were in order for White Wine grapes.

On motion,

The consideration of White Wine Grapes was postponed until to-morrow morning, at 9 A. M.

On motion,

The thanks of the meeting were tendered to Miller & Brother for the use of the plates used by the Association.

The Committee on Wine retired to sample the wine exhibited; and the Association resolved itself into Committee of the Whole, W. C. Flagg in the Chair. Finding the Wine Committee would be unable to finish their examination and report until a late hour,

The Association adjourned to 9 o'clock Thursday morning.

SECOND DAY—MORNING SESSION.

President Spalding in the chair.

The meeting was opened by the reading of an essay on

THE METEOROLOGICAL INFLUENCES AFFECTING THE GRAPE.

BY DR. J. STAYMAN, LEAVENWORTH, KANSAS.

Nature is a continued change, like the ebb and flow of the ocean. We have day and night, heat and cold, summer and winter, composition and decomposition. So in vegetation we behold the records of innumerable changes of seasons and variations of temperature. Each season's growth, like a link in a chain, is a complete cycle which enfolds the seasons and growths of ages. Nature is a book that develops the past, teaches the present, and determines the future. She gives the zone and climate best adapted to every plant. She gives the conditions *there* most favorable to their growth. She also determines the extremes of altitude, latitude and longitude, of light, heat and moisture. Her species and varieties are innumerable, yet in no case are the conditions of growth and health reversed. Her conditions are specific, yet they are varied for the development of each part. There is a stage of germination, growth, maturation, and rest, also corresponding degrees of temperature and moisture. Heat and moisture are necessary for germination, but also light and air for growth, and diminished moisture for maturation. Then heat and light, air and moisture are essential for the growth and perfection of vegetation. Seeds will germinate with heat and moisture, but plants will not grow without light and air. They absorb heat and light in relation to their *color;* they decompose carbonic acid in proportion to their growth, and require moisture in proportion to their growth and evaporation. In the rudimentary state they endure more moisture than heat, and in the maturing state more heat than moisture. Plants have distinct stages of growth, characterised by different conditions. What is essential for the one is not for the other. They have also distinct offices to perform, corresponding with their stages of growth. One is the expanding, developing or growing, and the other the condensing, solidifying or maturing. The first is characterized by an excess of moisture; the second by an excess of heat.

With these preliminary remarks on the growth of vegetation, we shall endeavor to apply these principles to the growth and perfection of the grape. It is not our object to show the zone or climate of the grape, but the conditions of its *healthy growth,* for if these cannot be obtained it makes little difference where it grows.

The grapevine being a very rapid grower, producing such large ratios of wood, foliage and fruit in proportion to the density of its stock, shows an extraordinary vital action which must have a corresponding reaction. As excessive growth is antagonistic to the production of fruit, so excessive *vital action* is antagonistic to the maturity of wood and fruit. Therefore, if excessive vital action is continued too long, there must be a corresponding time to condense, solidify and concentrate the essential elements to the different parts to mature and perfect the fruit and wood, otherwise it will be unable to perform its functions, and become diseased. The essential conditions of growing, ripening and maturing of wood and fruit is a definite amount of light, heat and moisture. Where these cannot be obtained, it is useless to attempt to grow the grape.

If there is a less average than 55 degrees of temperature for the growing months of April, May and June, and a less average than 65 degrees for the maturing months of July, August and September, and an average of 50 per cent. of clear sky, there can be no hope of success; but when the temperature averages 60 degrees for the former months, and 70 degrees for the latter, and an equal proportion of clear sky, and no change of temperature of more than 50 degrees in 24 hours, other conditions equal, success will be certain. And when the temperature averages 65 degrees for the first months, and 75 degrees for the latter, other conditions being equal, fruit of the greatest excellence can be raised, and wine of the greatest body and finest quality can be produced.

The conditions of heat and moisture are very different; the former is beneficial in proportion to the high temperature for the months of July, August and September, while the latter is in proportion to its diminished quantity for the same months.

The former we have no control over, and have to seek it where it exists; the latter we have some control of, and should seek to get rid of it. Where there is an average rain-fall of six inches for the months of April, May and June, and an average of five inches for the months of July, August and September, other conditions favorable, we cannot succeed in raising grapes unless controlled by artificial means. Where the average rain-fall for the first three months is not more than five inches, and the average for the latter three months is not more than four inches, other conditions favorable, some of the most hardy sorts can be raised. Where the average rain-fall for the first months is not more than four inches, and the average for the latter is not more than three inches, other conditions favorable, all the hardy varieties can be cultivated with success. But where there is a *less* average rain-fall than three inches for April, May and June, and a *less* average than two inches for July, August and September, all other conditions being favorable, fruit of the best quality can be raised, and wine of the greatest body and excellence can be made.

From the foregoing facts we come to the following conclusions: that the most favorable conditions for the cultivation of the grape is an average temperature of 70 degrees for the whole term of six months, and not less than 75 degrees for July, August and September, being 12,600 degrees for the growing and maturing seasons, and a less average rain-fall than 2.50 inches for the whole period of six months, and less than two inches of an average for July, August and September, being less than 15 inches for the whole season, and a clear sky and dry atmosphere for the latter three months, and where there is a less change of temperature than 50 degrees in 24 hours any time of the year.

Having finally arrived at some definite conclusion respecting the meteorological influences affecting the grape, we shall now endeavor to demonstrate the same by facts. In doing so, we hope to have your patient indulgence, for we are prone to condemn without examination.

We have no theories or opinions to give but what we believe are founded upon facts, and it has been by close observation and diligent investigation we have arrived at the above conclusions.

It appears strange that so many writers have been engaged in discussing this subject and nearly all agreeing that temperature and moisture have something to do with it, yet none have been able to point out any *definite condition*, leaving the whole subject in doubt, obscurity and perplexity.

We have no space in this article to fully discuss the subject, therefore we will give but a summary of the facts. In doing so we acknowledge our indebtedness to the Smithsonian Institute and Department of Agriculture, Washington City, D. C., for valuable meteorological reports. We shall give, in the first place, the meteorological conditions when the grape succeeded the best at a number of different points, to show the uniformity of certain conditions *favorable* to its cultivation; secondly, we shall give the meteorological conditions *when* the grape did not succeed at a number of the same points, showing the uniformity of different conditions *unfavorable* to its cultivation.

		Average of—					
	YEARS OF SUCCESS.	Apr., May, June.		July, Aug., Sept.		Six months.	
		deg.	in.	deg.	in.	deg.	in.
1863	Kelley's Island, O	56.3	2.40	68.6	1.48	62.4	1.94
1867	Kelley's Island, O	57.3	3.18	71.9	1.54	64.6	2.36
1860	Leavenworth, Kansas	63.1	.15	75.6	.23	69.3	.19
1867	Leavenworth, Kansas	60.6	4.81	73.6	2.88	67.1	3.84
1867	Cincinnati, O	63.4	3.40	78.4	1.28	70.9	2.34
1867	St. Louis, Mo	65.0	3.31	76.6	1.41	70.8	2.36
	YEARS OF FAILURE.						
1866	Kelley's Island, O	58.3	4.10	69.8	4.00	64.0	4.05
1865	Cincinnati, O	60.5	4.74	76.3	5.32	68.4	5.03
1866	Cincinnati, O	64.7	2.89	70.7	6.70	67.7	4.90
1865	Leavenworth, Kansas	63.8	5.37	74.7	7.09	69.2	6.20
1866	Leavenworth, Kansas	62.2	6.07	70.0	5.85	66.1	5.95
1867	Harrisburg, Penn	61.8	3.79	72.0	6.39	66.9	5.09

In the above table we give the average temperature and rain-fall of six places of success and an equal number of places of failure for the growing months of April, May and June, and the maturing months of July, August and September, and also the total average of the season. From these tables of seasons of success and failures it is very evident that there is a great difference in the amount of rain for the months of July, August and September. In no case of success does the average rain-fall amount to 3 inches for the above months, while in the seasons of failure there is no instance of less than 4 inches for the same months.

Now, if we take the average of seasons of success and failures, we find the following results:

	deg.	in.	deg.	in.	deg.	in.
Average of seasons of success	60.9	2.81	74.2	1.43	67.5	2.12
Average of six seasons of failure	62.2	4.61	72.2	5.89	67.2	5.25

From the above table we find the average temperature of the seasons of success for the months of July, August and September to be 74.2 deg., and the average rain-fall 1.43 inches for the same period. While we find for the seasons of failure the average temperature for the same months to be 72.2 deg., being a difference of two degrees, or 180 deg. for 3 months, and the average rain-fall 5.89 inches, being a difference of 4.46 inches, or 13.38 inches more for July, August and September.

That the success or failure depends upon the temperature and rain-fall of the above months is evident from an examination of the tables.

It will be seen that at Leavenworth, 1867, the average temperature for April, May and June was 66.6 degrees, and the average rain-fall was 4.81 inches; while at Harrisburg the average temperature was 61.8 degrees, and the average rain-fall 3.79 inches, yet at the former place the grape succeeded and at the latter place it failed. Now, if we compare the months of July, August and September, at Leavenworth, we find the average temperature to be 73.6 degrees, and the average rain-fall 2.88 inches, while at Harrisburg the average temperature was 72 degrees, and the average rain-fall 6.39 inches, being a difference of 10.53 inches of rain and 144 degrees of temperature for the whole of the above period.

The season of 1867 was remarkable for extremes, and shows most conclusively the truth of our position. East of the Alleghanies the grape was almost an entire failure; never was mildew and rot more prevalent, only the most hardy escaped; while west it was an unusually successful season. Grapes have never ripened so well, been so perfect, and contained so much sugar; even the Catawba and Isabella have done well.

To show the meteorological influences operating to produce this difference, we will give an average of the temperature and rain-fall for 1867 of the States wherein the grape has been most successfully cultivated:

	Average of April, May and June.		Average of July, August and September.		Average of the six months.	
New York	54.2	4.80	67.3	3.31	60.7	4.05
New Jersey	59.4	6.11	70.2	5.53	64.8	5.82
Pennsylvania	58.1	5.30	70.	4.83	64.0	5.06
Ohio	59.5	3.59	71.9	1.77	65.7	2.67
Illinois	59.2	3.69	73.1	2.07	66.1	2.88
Missouri	62.5	3.99	73.8	2.87	68.1	2.43
Kansas	61.2	5.19	75.3	2.94	68.2	4.06

By taking average of New Jersey and Pennsylvania we find 15.54 inches rain for the months of July, August and September; while if we take the average of the States of Ohio, Illinois, Missouri and Kansas for the same months, we have 8.31 inches less rain, and 156 degrees more heat; and if we compare with New York we find 2.70 inches less rain and 558 degrees more heat for the same period in favor of the West. But if we compare the average of Ohio, Illinois, Missouri and Kansas with the average of New York, New Jersey and Pennsylvania for 1867, we find the following results:

	Average of April, May and June.		Average of July, August and September.		Average of the six months.	
	deg.	in.	deg.	in.	deg.	in.
Average of Ohio, Illinois, Missouri and Kansas	60.6	4.08	73.5	2.40	6.7	3.24
Average of New York, New Jersey and Pennsylvania	57.1	5.41	68.9	4.55	63.	4.97

Here we see a difference of 414 degrees more heat and 6.45 inches less rain for the months of July, August and September, and for the whole period, 720 degrees more heat and 10.38 inches less rain in favor of the Western States.

Now if we compare the successful periods of grape culture with the success of 1867, as below seen, we find a perfect agreement in the conditions of success:

	deg.	in.	deg.	in.	deg.	in.
Average of successful periods	60.	92.81	74.2	1.43	67.5	2.12
Average of 1867	60.6	4.08	73.5	2.40	67.0	3.24

For the months of July, August and September, there is but seven-tenths of a degree of difference, and for the months of April, May and June, but three-tenths, and for the whole period but five-tenths. Although we find considerable difference in the fall rain for the months of April, May and June, yet it is not above the conditions of success, while for the months of July, August and September, it is below the conditions of success.

Some may, however, think that the failure of the grape crop east of the Alleghanies was entirely due to the low temperature of the season. That heat is absolutely necessary, we admit, and a high temperature is requisite to concentrate the sugar for making wine of great body; yet we will show that the temperature there was sufficient to mature grapes of good quality, provided the conditions of moisture had been favorable. We herewith annex a table of the average temperature of New York, New Jersey and Pennsylvania, for 1867, with the temperature of Kelly's Island for 1863, a successful season, and also Toulouse and Dijon, France, where the grape is known to succeed:

	Average of April, May and June.	Average of July, Aug. and Sept.	Average of the six months.
	deg.	deg.	deg.
New York, New Jersey and Pennsylvania, 1867	51.1	68.9	63.
Kelley's Island, 1863	56.3	68.6	62.
Dijon, France	59.2	68.3	63.4
Toulouse, France	60.1	68.8	64.7

Here we have such an agreement in temperature that no person could believe a failure to originate from that cause, and if anywhere, it would have been at Kelley's Island, for there the temperature was the lowest; but that was not the case, for the rain-fall that season was but 1.48 inches of an average for July, August and September, and for the months of April, May and June, an average of but 2.40 inches, which was 2.16 inches less than the average of the years of success.

Although the grape may succeed at the above temperature, it is not sufficiently high to produce wine of great body unless under the most favorable circumstances, such as clear sky and very little rain during the maturing of the grape.

Having finally determined, by observations made, the lowest temperature and the greatest amount of rain the grape will endure to ripen well, we shall now endeavor to show that the quality and perfection of the grape and the body and excellence of the wine are in proportion to the *high temperature and diminished rain-fall of the season.* In doing so we shall only give the places where wine of the greatest strength and best quality is made.

We have no report of Hammondsport, New York, a celebrated wine locality, but in the absence of such we shall let Kelley's Island represent it:

	Average of					
	April, May and June.		July, Aug. and Sept.		Six months.	
	deg.	in.	deg.	in.	deg.	in.
Kelley's Island, Ohio, 1867	57.3	3.18	72.0	1.54	64.6	2.36
Cincinnati, Ohio, 1867	62.3	3.95	76.7	.98	60.5	2.44
St. Louis, Missouri, 1867	63.7	3.94	75.1	1.65	60.4	2.81
Los Angeles, California	65.	......	75.	......	70.	......
Cadiz, Spain	63.8	......	71.	......	69.4	.....
Maderia, France	65.1	......	71.2	......	68.1	......
Marseilles, France	63.4	......	72.1	......	67.7	......
Naples, Italy	64.1	......	73.9	......	69.	......

In this table of temperature and rain-fall for Ohio, we find 305 degrees more heat and 7.56 inches less rain for July, August and September than the average of Ohio for ten years. For

Missouri the temperature is a little higher, but we find 6.60 inches less rain for July, August and September, than its average for ten years.

This high temperature and very little rain-fall in the maturing season has been favorable to the grape, as the reports will show. Mr. F. R. Elliott, of Cleveland, Ohio, who is of the highest authority, says, in the December number of the *Horticulturist:* "During my whole acquaintance with grape growing I know of no record of a season when the grape crop has been so full throughout the entire North and West as it has been this year of 1867." A writer in Colman's *Rural World,* November 15, says: "The season has been of the most favorable character for development of the excellence of the grape, and the vintage of 1867 will be of a marked character. Our fervid sun and cloudless sky and protracted drouth which has so seriously reduced the products of our fields and gardens, has developed the elements of the grape in its greatest perfection, and it has prevented the *necessity* of Gallizing." The editor of the *Gardeners' Monthly,* Mr. T. Meehan, says the same in regard to the superior quality of the grape in the West, in the November number of the *Gardeners' Monthly.*

The above we think sufficient to show that the season of 1867 has been a very favorable year in the West for the grape, corresponding with the high temperature and little rain-fall of the above tables. We place here a table of the strength of the must by Oeschle's must-scale, of a few varieties:

	Hammondsport, N. Y.	Cleveland, Ohio.	Hermann, Mo.
Concord	73	81	82
Ives' Seedling	77½	83	......
Isabella	66½	84	......
Clinton	92	93½	103
Norton's Virginia	89	105	115
Delaware	95	104½	105
Catawba	81	94	90
Iona	92	......	......
Cynthiana		......	118

From the above reports we see that the grape has been remarkably rich, and wine of great body has been made, agreeing with the conditions of temperature and moisture.

We placed to the tables of temperature Los Angeles, California, where they have no rain during the whole season, yet we have never heard of a failure. We also placed Cadiz, Madeira, Marseilles and Naples, the best locations in Europe, where wine of the greatest body and strength is made, and of the finest quality. We have no monthly report, but they have here less than fifteen inches of rain during the whole growing and maturing seasons, which is ten inches less than our average. In the dry seasons of 1834, '42 and '46 in France they made wine of the very best quality.

From the above reports we believe we have fully sustained our position, viz., that the quality of the grape wine is in proportion to the high temperature of the season, particularly July, August, September, and the diminished rain-fall.

Having shown that wherever excessive moisture exists, the cultivation of the grape is uncertain, and wherever extreme dryness exists it is successful in regions of favorable temperature, we shall now give what we believe to be the principal remedies to overcome this excessive saturation of the soil.

If our conclusions are correct, *surface draining* is undoubtedly the most important; for if the soil does not receive more than a proper amount of rain there is no necessity of underdraining, unless the soil is naturally wet or receives it from adjoining land. The next most important is location, in fact it is but a different expression for the same thing, for we can more effectually surface drain by selecting a location than by any other means. The sides of steep hills, gentle slopes, and even the summits of high hills are the best, and stony land mixed with shale or pebbles, with clay subsoil of sufficient richness would be the most desirable. So important is surface draining that we might sum up the whole success of grape culture to depend upon it in a wet season. We have closely watched the effects of planting upon level ground, even well drained, and I find it is useless to compete with the high hills and steep slopes, and we have removed our vineyards accordingly, a few years ago, with most excellent promise. We would refer you to an excellent article in the November number of the *Gardeners' Monthly* upon this subject, which contains more good sense than a column of grape articles, by the editor of the *Monthly.*

It was on motion,

Resolved, That the President, Vice President and Secretary shall form a publication committee.

The following report was presented by the committee on synonyms:

The committee on synonyms have performed the duty assigned to it, and beg leave to report the result of their examination of the collection of grapes on the tables, which is as follows:

Kœnig and Gast's assortment is all correctly labeled, excepting that marked as Roger's Hybrid No. 15 which is incorrect, but the committee were unable to determine what number of said Hybrids it is.

The varieties of Mr. McPike's assortment are all correctly named.

The list of J. E. Starr is correct, excepting the following: The Golden Clinton is the Taylor. The Mead's Seedling is the Catawba, and the Mary Ann is the North Carolina.

The varieties in John H. Tice's assortment are correct as far as known, excepting the Adams, Pennel and Ohio claret, which have so many properties of and resemblances to the Clinton, that if not identical, are at least undistinguishable from it, they therefore call them Clinton. The one labeled "seedling of the Taylor," though having fuller bunches and more prolific than its reputed parent, yet its quality and other properties seem identical with the Taylor, the committee therefore call it Taylor. This seems identical with that called Golden Clinton in Mr. Starr's assortment. The Powell received from Powell's Valley, Virginia, is in the opinion of your committee the Taylor, notwithstanding the deeper amber colors of its berries.

The Louisa, of Schrœder, and the Louisa of the Agricultural Department are not identical, but neither is correct. The true Louisa is black, while both these are amber, though of different shades. The committee were unable to name them.

The varieties in Mr. Jordan's collection are correctly named as far as the committee could determine. The one labeled Ste. Genevieve is identical with the American Rulander, as distinguished from the European.

In Mr. Mason's collection the only misnomer is that of Roger's Hybrid No. 12, which is labeled Roger's Hybrid No. 1. Mr. Mason's collection also has that called Adams' in Mr. Tice's collection, though he has no name for it, but thinks it differs from the Clinton.

The committee think that unless there is a strongly marked difference, varieties should not be multiplied, and therefore call it Clinton.

Dr. Spalding's assortment is all correctly labeled, excepting that labeled Cape, which is Isabella.

B. F. Lazear's lot is labeled correctly; that marked No. 2 asking for a name is Union Village.

Mr. Charles Hinckler's collection are all correctly labeled.

Mr. George H. Gill presented a white grape under the name of Kirkwood Malaga, or Rebecca. The committee could not identify it with the Rebecca.

The nomenclature of Mr. George Husmann and of Isidor Bush's assortments, and that of Dr. Hull's, were found correct.

All of which is respectfully submitted.

GEO. HUSMANN,
J. H. TICE,
E. S. HULL.

The special order being grapes for wine, of a light color:

Herbemont received	8 votes.
Catawba received	6 votes.
Delaware received	7 votes.
Cunningham received	2 votes.
Roger's No. 1 received	4 votes.

Mr. Starr.—This last is productive and hardy. There is a fault in its foliage, it is thin and papery. Perhaps adapted to peculiar localities.

President.—The foliage seems defective.

Martha received 1 vote.

President.—Wine good. Variety perhaps not old enough to be fully tested yet.

VARIETIES THAT PROMISE WELL.—MAXATAWNEY.

Mr. Flagg.—I have not much to say on that. Those not receiving the proper vote, should be put on the list for further trial. Carried.

TAYLOR'S BULLITT.

Mr. Flagg.—I ask for information. Have heard of its being faulty in its bunch. It is said it does not do well when bearing on the young wood; if spurred from old wood does well.

Mr. Starr.—Has same, got them from Dr. Schrœder, he sent me 35 as Golden Clinton. I planted them among my Clinton. They have good crops.

B. F. Lasear has about 300 vines, got about as much must from them as would make a gallon of wine.

Dr. Claggett has noticed some localities where they do well. Upon poor soil they do well. Have a few vines, pursued the spur system of pruning, have never produced a large crop. This season has done much better.

Taylor was lost.

Diana—Mr. Kingsbury thinks the Delaware comes nearer to producing a normal must, and the next is the Diana.

No votes.

Rulander—Mr. Flagg.—Do not know much of this as a wine grape. It is a grape that eats well.

The President has known it eight or ten years; makes a good wine; would place it on the list.

Dr. Clagett—A grape so long on trial that has not found favor will not do.

Rulander, three votes.

North Carolina proposed, upon which it was moved and carried that the list of white wine grapes close.

PRUNING THE GRAPE

Was then taken up.

Dr. Clagett suggested that pruning and training should be considered together. The different modes of training require modifications in the pruning. No man can prune well without having a distinct end in view. We must know the office of the parts to be controlled. The leaves and the roots are the important parts of the vine. If the vine is properly planted, the roots will take care of themselves. The leaves are the great regulators of life. Never have two leaves where one will do the work. The leaves feed the fruit, and nourish it. We must think of the work to be done by the leaves this year, and the next as well. If we have not the leaves this season, we cannot have the fruit-bud or the fruit the next. We must work, not contrary to nature, but in harmony with her. We must set out to get the largest amount of leaf surface and fruit-buds for the next year, and next, learn how to do this.

Mr. Lawson, of Louisiana—I have planted 1,000 Delaware vines; rows six feet apart; vines four feet apart. Now I have come here to learn how I shall manage them.

Dr. Clagett—My experience with these is limited. I set the buds evenly on a trellis, so as to expose the foliage as much as possible to the air and light.

John H. Tice—We can learn here much upon the subject of pruning. It is the most important subject that can be taken up, and is the least understood. We have seen whole vineyards slaughtered, both by summer and winter pruning. We must understand vegetable physiology. We will then know, for instance, when the soft sprouts come out at the base of the stem, that we must pull them off before they form roots. Those that thus remove them understand vegetable economy. Thus we find there are processes we can illustrate.

If we take the cotyledon of the seed to the chemist, he will tell of changes taking place in the elements of the seed. When the seed is put in contact with heat and moisture, we find the radicle going down and the plumule pushes up to the light. There is nourishment stored up in the cotyledon, that it can supply plant food till its organs are developed, and it is capable of sustaining itself from the earth and air. The sap rises into the leaves, and changes from the upper surfaces of the leaves into the lower, and descends into the wood with its new layer of wood material. Mildew often strikes our leaves, and they cannot perform their functions. A little spore has been developed in them, and they fail, and the spores are stored up, awaiting circumstances to develop them next year. New leaves come out, and they produce immature wood.

In regard to summer pruning, we say, never touch them after the first of July. We want sufficient foliage to mature the fruit. As to the canes for the next year, let us never touch them. Throw the whole strength of the vine into the canes to bear fruit the next year. Thus we can understand the principles that underlie all our operations.

J. M. Jordan—Should the ground be shaded?

J. H. Tice—The sun is the great source of growth, and stimulates both roots and leaves.

George Husmann—I hear that the question of summer pruning is up. There are very different views on this subject. Some take the view that every leaf upon a fruiting cane is wasted. Others say that we should have two leaves instead of only one. I take the view that the leaves are the lungs of the plant. We should encourage leaves in their proper places. Go to the vineyard in the spring, before the bloom is open, and pinch off the point, and the cane pushes out a lateral at the axil. This is then pinched in the same way. So I do this till I get three leaves in the place of one. Our vines should not be pinched after the middle of June. Pruning after this is injurious.

Some think that every leaf they take from the fruit cane, takes so much from the demand on the fruit.

Dr. Clagget—If the canes fall down over the trellis, on the fruit, what would you do?

Mr. Husmann—I think the thicker the leaves are upon the top of the trellis, the better for the fruit.

Dr. Claggett—It is not the amount of leaves upon the vine that regulates the growth, but the leaves that are in healthy action.

Some of the leaves get into bunches, are crowded and die; this induces disease.

Dr. Hull—Some think that the Hermann plan is wrong, thus to allow the last growth to overshade the fruit leaves. I believe that when we have produced a competition in the leaves, we defeat the object we have in view, the getting of fruit. In the spring the roots are not furnished with spongioles, the demand upon the plant is then light, as the plant grows they throw out little roots like hairs, and the spongioles are thrown out on these. As the starch is changed into sugar, it is absorbed and is stored up to nourish the germ of the future growth. When by over-cropping the nourishment in store is used up, the crop for the next year fails. The buds are formed while the fruit is growing.

Take a fruit bud early in the season, in the case of the peach, and it will become a wood bud upon a strong stock. I grow up three to four canes, and select the weaker ones to get the best fruit.

Mr. Flagg—In the system of pinching, as given by Mr. Husmann, he gets three leaves in the place of the one original leaf. There should not be two leaves where one will do the work. I think it well to manage on this principle if we can get rid of the "leafhopper." A certain number of leaves will do the work, but this leafhopper takes the very first leaves, those that are wanted the most. The thin leaved varieties he sucks dry; the thick leaved varieties he cannot work so well. If he gets along during the next four years as well as he has done the four years past, we may bid good-bye to grapes.

It was

Resolved, That we suspend further discussion, to hear Mr. Riley, State Entomologist, on insects.

Mr. Riley gave a very lucid statement of the insect foes and friends of the grape grower, exhibiting specimens from his fine collection, all of which being accompanied by illustrations, will be found in his report to the Legislature.

The *American Entomologist* was very highly praised by several, and recommended to be read by every cultivator of the soil.

Mr. Starr read the following report of the committee on wines:

Your committee appointed to report upon the samples of wines presented, would respectfully present the following as their report:

The collection was large and varied in its character. Among them were several new candidates for public favor, which your committee were pleased to find possessed of excellent and promising qualities.

Of Catawba there were ten samples of nearly uniform excellence.

Best—Geo. Husmann.

Second best—Committee equally divided between samples shown by E. A. Thompson and A. Engelman—one member of the committee being absent.

Isabella—B. F. Lazear.
Martha—Geo. Husmann.
Diana—J. E. Starr.
Rogers No. 1—Geo. Husmann.
Cassady—Geo. Husmann.
Herbemont—Geo. Husmann.
Rulander—Geo. Husmann.
Taylor—C. A. La Coste.
There were three samples of Delaware; best, Geo. Husmann.
Concord—Ten samples presented; best by Geo. Husmann.

Creveling—Geo. Husmann.

Clinton—E. R. Mason, best; C. A. La Coste, second best.

Norton—Geo. Husmann, best; G. L. Ditch, second best.

Cynthiana—Geo. Husmann—only one sample presented—excellent wine.

California Wines—Six samples presented by Crane & Letcher, described as follows:

No. 1—Wine made in 1866 from the grapes Johannesberg and Franken Reissling.

No. 2—Wine made in 1862 from the California or Mission grape, being a Spanish grape introduced into California by the Catholic padres who founded the missions of Alta California.

No. 3—Wine made in 1866 from the California or Mission grape.

No. 4, Red Wine—Wine made in 1866 from the Malvoise or Malvasia black variety.

No. 5—Wine made in 1863 from California or Mission grape.

No. 6—Wine made in 1865 from the Chasselas and Gray Malvoise or Malvasia grapes.

All of the above wines were grown by Dr. Geo. B. Crane, upon his vineyards at St. Helena, Napa Valley, California.

The committee were not favorably impressed with these wines, being of the opinion that they had been treated with brandy.

The native wines examined were of the vintage of 1867, which will long be referred to as a standard of excellence. The great drouth of 1867 imparted a rare excellence to the grapes of the year, and the quality of the wines made from them.

JAS. E. STARR,
GEO. HUSMANN,
E. S. HULL,
A. ENGELMAN,
Committee.

Mr. Husmann read a private letter from M. H. Lewis, of Sandusky, Ohio.

On motion,

Resolved, That the next meeting of the Association be held at Alton, Illinois, on the second Tuesday of April, 1869.

Dr. Hull suggested that the society offer premiums on wines at the April meeting, and proposed that the exhibitors contribute a certain sum each towards making up a premium fund.

After an interchange of opinion on the subject, it was voted that a committee, consisting of Dr. E. S. Hull and Jas. E. Starr, of Illinois, and Geo. Husmann and Dr. C. W. Spalding, of Missouri, be appointed, with full powers to arrange and publish a premium list for the spring meeting of the association.

The President was instructed to issue a circular to each of the members and others interested in the objects of the Association, calling attention to the next meeting.

The thanks of the society was tendered to the reporters and editors of the press of the city for their attention to the objects of the Association, as exhibited in full reports and notices.

The President was instructed to endeavor to procure an ice-box, in which to preserve the wine presented at our next meeting.

It was

Resolved, That the thanks of this Association are hereby tendered to the Honorable County Court of St. Louis county, for the use of this room for the present meeting; and to Mr. Quigley, janitor of the court house, for his attention and courtesy.

It was

Resolved, That an appropriation of $10 be made for cleaning the room and other incidentals.

On motion, the meeting adjourned.

WILLIAM MUIR, *Secretary.*

ERRATA

IN LECTURE ON ANATOMY, PHYSIOLOGY AND ECONOMY OF PLANTS.

Page 308, in second line of clause, commencing "Firstly," for "body of the plants," read *body of plants.*

Page 309, in fourth line, for "germination" read *gemmation*; and on page 316, in lines 23 and 26, and on page 320, in line 17, for "germination" read *gemmation.*

Page 310, in 8th line of paragraph headed "cytoblast," for "nucleoli" read *nucleolus.*

Page 313, in line 19, for "modes" read *nodes.*

Same, the 13th, 12th and 11th lines from the bottom should read "the elaborated elements in the descending sap transforming and fixing them as cambium. The cambium and the inner bark are the main storehouses of starch and of the azotized compounds," etc.

Page 351, in second line, for "end" read *seedlobes.*

Page 316, the last word but one, of 1st paragraph, read *sprouts* for "spouts."

Page 317, in first line, for "rust" read *rest.*

Page 318, in first line of last paragraph on leaves, for "The inspiration of the sap," read *The inspissation of the sap*. Same paragraph, in next to last line, read *its* before "downward."

Page 319, in last line of second paragraph, read *spore* for "spord."

Same page, in next paragraph, read *stamen* for "stamens," and *anther* for "auther."

Page 221, line 7, for "what does it enter" read *what does enter.*

Page 323, in 3d line of 3d paragraph, for "acidulous pieces" read *acidulous juices*; and in next line, for "acid" read *aid.*

Page 326, in next to last word of 3d paragraph, read *his* for "its."

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FIRST ANNUAL REPORT

ON THE

Noxious,

BENEFICIAL AND OTHER

INSECTS

☞ The plates are omitted in this copy, owing to the fact that there were not enough printed to furnish the whole edition of the Report.

STATE OF MISSOURI,

MADE TO THE STATE BOARD OF AGRICULTURE, PURSUANT TO AN APPROPRIATION
FOR THIS PURPOSE FROM THE LEGISLATURE OF THE STATE.

BY CHARLES V. RILEY,
STATE ENTOMOLOGIST.

JEFFERSON CITY, MO.,
ELLWOOD KIRBY, PUBLIC PRINTER.
1869.

INTRODUCTORY.

To the Members of the Missouri State Board of Agriculture:

GENTLEMEN:—I herewith present my first annual report on the Noxious, Beneficial and other Insects of the State of Missouri, pursuant to your instructions of April 1st, 1868.

It is neither so full nor so valuable as I hope to make its successors, should the office be continued. This is principally owing to the fact, that but eight months have elapsed since my appointment, and that the natural history of a number of the insects that received my attention during the summer, can only be given after they have completed their transformations, which will require one, two and in some cases, even three years.

I have been exceedingly gratified at the warm reception which I have met with from all quarters. Wherever I have been, from one end of the State to the other, the cordial hand has been extended, and I have found our farmers and fruit-growers thoroughly alive to the importance of the work, for they know full well that they must fight intelligently, their tiny but mighty insect foes, if they wish reward for their labors. During the year 1868, insects injurious to our fruits have been unusually numerous, but it may well be asked whether this increase is not a meteorological effect, as was suggested by Mr. W. C. Flagg, in his *ad interim* report to the Illinois State Horticultural Society, rather than one caused by the increase of our products. The severe drouth of 1867, had a peculiarly injurious effect on many trees, and it seems quite evident that certain insects increase more rapidly in injured fruits and injured trees than in those which are healthy and vigorous. The part, indeed, which insects principally have to play in the economy of this world, is that of scavengers. They hasten the decay and dissolution of unhealthy vegetable organism, the quicker to convert it into mould, and make room for healthy plants; while they multiply at such a prodigious rate, that whenever the conditions are at all favorable to the increase of a particular species, that species appears as if by magic, over vast districts of country, and commits sad havoc to either orchard or field crops, as the case may be.

With this view of the matter, we might materially check the increase of some insects, by anticipating Nature in her operations, cutting down such trees as have been injured from whatsoever cause, so that they shall not remain from year to year as a hiding place for noxious insects, or as a hot-bed for equally injurious funguses.

The peach crop failed pretty generally on account of the great increase of the Plum Curculio, and the opinion has been advanced and extensively published, that this insect will cause a failure of that crop in certain districts for very many years to come. Let the wise place no confidence in such predictions, for the predictors can have but a vague conception of the grand scheme of Nature, and of the laws which govern both animal and vegetable life. For many reasons unnecessary to mention, the prospect for a good crop the year succeeding an entire failure, is greater than at any other period—at least so far as insects are concerned. Because an insect is numerous and destructive one year, therefore it will be even more so the next, is apparently plausible but very fallacious reasoning. Every one of the thousands of species which are known to exist, multiplies at a sufficient rate to entirely cover our globe, in a comparatively short time, if nothing hindered; and the struggle and warfare necessary to enable all the different species to exist and hold their own, causes a constant fluctuation in the relative proportion of each. We have an illustration of this in the case of the Colorado Potato Beetle; for in those districts where it had caused so much alarm in 1866 and 1867, its enemies have so increased that it was comparatively harmless in 1868.

The importance of the study of Entomology has already become apparent to every tiller of the soil, but there is yet a class of citizens who fail to appreciate the laborious efforts of an Entomologist, and cannot conceive how the "study of bugs," as they term it, will redound to the good of a State or community. For the benefit of such, let me say, that in his last annual address the president of our State Horticultural Society, estimated the annual loss to our State from insect depredations at SIXTY MILLION DOLLARS! Now, allowing this estimate to be twice as great as the facts will warrant, the sum is yet quite enormous. It is not possible by any preventive measures to save the whole of this immense sum, but it is perfectly practicable to save a large percentage of it, and in this assertion I think the following pages will bear me out. A knowledge of the habits and transformations of insects frequently gives the clue to their easy eradication and destruction, and enables the agriculturist and horticulturist to *prevent* their ravages in the future. It likewise enables them to distinguish between their insect friends and insect enemies, and guards them against the impositions of the numerous quacks and nostrum-venders, who, with high-sounding words are constantly putting forth every energy to sell their vile compositions. Such a knowledge of insects the farmer has not time to acquire, for it is only obtained by an immense amount of hard labor in the field and anxious deliberation in the closet. Hence, the wisdom of having a State officer who can devote his whole time to the work.

Fully aware that I write for those who, as a rule, are unversed in Entomology, I have endeavored to treat of each insect with as little of the nomenclature of science as is consistent with clearness of expression. Yet, as much that is of scientific interest, such as descriptions of new species, must necessarily be inserted, I have had such descriptions printed in a type of smaller size than the text, so that it can be skipped if desirable, at the time of reading, and easily referred to for comparison, with specimens which one is desirous of naming. I have also endeavored to illustrate, as far as possible, the insects of which this report treats, believing that good illustration forms the basis of successful teaching in a science with which the general husbandman is not expected to be acquainted; for the eye conveys to the mind, in an instant, what the ear would fail to do in an hour. The practical man cares little to what genus or family an insect belongs, so long as he can tell whether it be friend or foe. He must become familiarized with the insects about him without having necessarily to overcome scientific detail and technicality.

I have made no effort at a systematic arrangement of the insects treated of. Indeed, that were useless for the purpose in view; but in order that the reader may refer the more readily to any particular insect which interests him, I have separated them into three series—Noxious, Beneficial and Innoxious—and attached a very full index. For the benefit of those who are making a study of Entomology, I have also given, with each species, the order and family to which it belongs, in parenthesis under each heading.

So far as possible, I have used a common name for each insect, knowing that the scientific name is remembered with greater difficulty, and is, consequently, distasteful to many. But as popular names are very loosely applied, and the same name often refers to different insects in different localities, a great deal of confusion would ensue without the scientific name, which is, therefore, invariably added for the most part in parenthesis, so that it may be skipped without interfering in any way with the sense of the text.

The sign ♂ wherever used in this report, is an abbreviation for the word male, the sign ♀ for female and the sign ⚲ for neuter.

Wherever the illustrations are enlarged, they are accompanied by hair-lines, which designate their natural size.

Where the measurement of an insect is given, the dimensions are expressed in inches and the fractional parts of an inch, 0.25, thus implying a quarter of an inch, and 1.25 one inch and a quarter, etc.

Many letters were addressed to me, during the summer, inquiring as to the value of the new carbolic acid, which has been so much spoken of. Having fully experimented with it during the summer, I am well pleased with it as an insect destroyer. But a word of warning in its use is necessary. It is also known by the name of cresylic acid, the difference between the two being one of purity only. Many, having seen it recommended, ordered the crude acid, and, using it—no matter how much diluted—they found to their sorrow that it killed their plants. *Carbolic acid mixes well with alkalies, but not with water, and it can only be used as a saponaceous compound.* This fact must be borne in mind by those who wish to use it.

As I shall frequently have occasion to refer to the "AMERICAN ENTOMOLOGIST," it is but proper to say, that in conjunction with Mr. Benj. D. Walsh, State Entomologist of Illinois, I commenced last September, the publication of that journal. It is devoted to Economic Entomology, and is published monthly, by R. P. Studley & Co., of St. Louis, at $1,00 per annum. We felt that pending the issuing of our annual reports, something was needed, as a more frequent means of communication with the people. The paper has received the highest encomiums from the press throughout the country, and as an enterprise has proved successful beyond our expectations—evidence of the great demand for, and need of, the kind of information which it gives.

As there must necessarily be a limit to a report of this character, I am compelled to defer till another year, accounts of the Chinch Bug, Rocky Mountain Grasshopper, and some other insects which attracted general attention during the year, and do so the more willingly, that their habits have been pretty fully given in former publications, and in the above periodical.

In conclusion, I tender my sincere thanks to those gentlemen, throughout the country, who have assisted me in one way or another, and especially to the Superintendents of the Pacific, Iron Mountain, Hannibal & St. Joseph, and North Missouri Railroads, for free passes over their respective routes.

Respectfully submitted,

CHARLES V. RILEY,
State Entomologist.

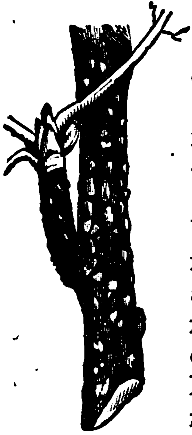
ST. LOUIS, MO., Dec. 2d, 1868.

NOXIOUS INSECTS.

THE BARK-LICE OF THE APPLE-TREE.

(Homoptera, Coccidæ.)

[Fig. 1.]



There are two species of Bark-lice that attack the Apple-tree in the United States, which I will briefly describe.

The first, which is a native North American insect, is now known as Harris's Bark-louse (*Aspidiotus Harrisii*, Walsh.) The color of the scale is dirty white, and its form is irregular, being usually egg-shaped; but, however variable in outline, it is always quite flat and causes the infested tree to wear the appearance of Figure 1; while the minute eggs which are found under it in winter time are invariably blood red or lake-red. This species has scarcely ever been known to increase sufficiently to do material damage, for the reason doubtless that there have, hitherto, always been natural enemies and parasites enough to keep it in due bounds. Though I have not witnessed it in Missouri myself, I am informed by several persons that it occurs in the northern part of the State, and a communication from R. B. Palmer, of Hartville, Wright county, published in the *Rural World*, of October 15, 1866, and stating that the lice are destroying the best apple orchards in that neighborhood, evidently refers to this species.

The second species, which is known as the Oyster-shell Bark-louse (*Aspidiotus conchiformis*, Gmélin), is by no means so harmless however, for it is one of the most pernicious and destructive insects, which the apple-grower in the Northern States has to contend with. This species presents the appearance of Figure 2, and may always be distinguished from the former by having a very uniform muscle-shaped scale of an ash-gray color (the identical color of the bark), and by these scales containing, in the winter time, not red, but pure white colored eggs.

[Fig. 2.]

There is scarcely an apple-orchard in Northern Illinois, in Iowa or in Wisconsin, that has not suffered more or less from its attacks, and many an one has been slowly but surely bled to death by this tiny sap-sucker. It was introduced into the Eastern States more than seventy years ago from Europe, and had already reached as far west as Wisconsin in 1840, from whence it spread at a most alarming rate, throughout the districts bordering on Lake Michigan. It occurs at the present time in Minnesota and Iowa, but whether or not it extends westward beyond the Missouri river, there are no data to show. Its extension southward is undoubtedly limited, for though so abundant in the northern half of Illinois, observation has clearly proved that it cannot exist in the southern half of the same State. I have also experimentally proved that it cannot exist in the latitude of St. Louis, the experiment being made in the following manner: On the 12th of May last, I received some scales from Jesse Hodgson, of Panola, in Woodford county, Illinois, the eggs under which were at that time hatching. Upon fastening the bark containing these scales to the twigs of a living apple-tree, that being in a position where I could easily watch them, the young bark-lice crawled actively over these living twigs, and soon fastened themselves, as is their wont, around the buds. They soon began to secrete the waxy fibres, shown at Figure 3, 3, and in time assumed the white appearance of the first scale, which has been very aptly termed the *larval* scale by Mr. Walsh. But the growth at this point was arrested and they all soon afterwards died. As there were three twigs thickly covered, and as I could discover no parasites or cannibals of any kind, it is to my mind conclusive that THIS BARK-LOUSE CANNOT EXIST FURTHER SOUTH IN MISSOURI THAN ST. LOUIS. The experience of others is to the same effect, for Dr. Morse informs me that certain apple trees which he procured from the North, and which he planted at Kirkwood, St. Louis county, some years ago, though covered at that time with these bark-lice, are now entirely free of them; and Mr. Wm. Muir, of Fox Creek, in the same county, has had a similar experience with trees which he imported several years ago from Burrell & Co., of Lockport, N. Y., and which at the time of their receipt were very badly infested.

The fruit-growers of Southern Missouri, have therefore little to fear from this Oyster-shell Bark-louse, and it is not unlikely that it would die out in the country considerably north of St. Louis, if imported there; but, as it exists and flourishes near the southern border of Iowa, and extends, in Illinois, below our northern boundary, there is every reason to believe that it will flourish in the extreme northern counties of our State if once introduced there. Now, up to the present time, it has not made its appearance, as far as I can learn, in any of the orchards in that part of Missouri, and it seems that, as a State, we are entirely exempt from this most grievous orchard pest. In order to definitely decide this matter I took particular pains, while at Hannibal during the summer, to inquire of the old fruit men there on this point, and even John Fry, one of the oldest settlers, has never heard of its appearance in that vicinity. The responses from numerous letters that were sent, with the same query, to men living in other northern parts of the State, are to the same effect. Believing therefore, that this insect *can* flourish in our extreme northern counties if once introduced there, and that at present the fruit-growers of that region are exempt from it, I cannot too strongly urge them to hold the vantage ground they now have. *Let every man therefore who reads this report, and who contemplates planting an apple orchard in North Missouri, in duty to himself and to his neighbors, subject every young tree which he receives from northern or eastern nurseries, to a rigorous inspection; and if any be found infested, let them be thoroughly cleansed before planting. By this means alone, can we hope to retain that immunity, which we have so far enjoyed!*

It should indeed be a maxim with fruit growers to inspect all young trees received from a distance; for many of our very worst insect foes, such as the Canker-worm, Root-louse, etc., are undoubtedly transported from one place to another, principally on nursery stock. In order that the Oyster-shell Bark-louse may be at once recognized and thoroughly understood, I will proceed with its history:

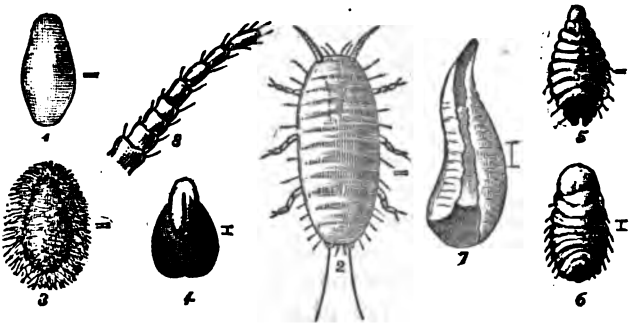
During the summer of 1867, three independent observers were closely studying the habits of this insect in Northern Illinois, unbeknown to each other, namely: Dr. H. Shimer, at Mount Carroll; Benj. D. Walsh, at Rock Island, and myself, at Chicago. Up to this time, though it had frequently been treated of, yet much that was recorded of its history was mere conjecture. For instance, Harris states that there are two broods each year, while Fitch assures us that the scales are the bodies of the gravid females, covering and protecting their eggs; neither of which is the case.

The gist of Dr. Shimer's observations which were recorded in a paper published in the Transactions of the American Entomological Society, (Vol. 1, No. 4) are, 1st—that he discovered that the tarsal joint of the newly hatched larva, which is very small, possesses no claw, but is furnished at the extremity with four fleshy hair-like processes upon which the young louse walks, and which he calls *digituli;* 2d—that the scale is constructed by the insect, and consists of the moulted skins of the louse, soldered together by some secretion which he believes to be the excrement. In these characteristics, he finds sufficient grounds for separating this insect from the Bark-louse family (COCCIDÆ) to which it has been referred by Linnæus, Gœffroy, Fabricius, Burmeister, Reaumur, Curtis, Westwood, and many other authors, and erects a new family (LEPIDOSAPHIDÆ), and a new genus (*Lepidosaphes*), to contain it. He furthermore takes it upon himself to deny what all these authors have insisted upon, viz:—that the loss of members, or the change from the perfect and active larval form represented at Figure 3, 3, to the motionless and memberless forms shown at 5 and 6 of the same figure, is an evidence of the degeneration or degradation in this insect as it approaches the imago state.

Mr. Walsh, whose observations are recorded in his First Annual Report, as Acting State Entomologist of Illinois, found nothing to induce him to separate this insect from the old genus *Aspidiotus* in the Bark-louse family, to which it had hitherto been referred. He also showed that there were three distinct growths of the scale, differing from each other in size and color, which he named respectively the "*larval scale*," "*medial scale*" and "*anal sack*." He also inclined to believe that both the "medial scale" and "anal sack" were formed "by the anal surface of the original young larva being at two successive periods abnormally dilated and extended backwards, in the form of a sack closed at tip; and that, after this process is accomplished, the insect always moults or sloughs off the whole of the external scale." As to the formation of the "larval scale" he offers no explanation.

My own observations will be found in the "Report of the Committee on Entomology," published in the Transactions of the Illinois State Horticultural Society for 1867—pp. 109–112. Having had no opportunity of continuing them the past summer, and as they will convey a good idea of this insect's mode of growth, I repeat them in part.

[Fig. 3*.]



The young lice usually leave the scales during the first week in June. Prior to their hatching, the eggs which were previously snow-white, become yellowish, and if the weather turn cool, immediately after hatching, they will remain for two or three days under the scales before dispersing over the tree. The following notes as before stated, were made in Cook County, Illinois.

June 6th.—Most of the eggs are hatched, but the young have not yet left the scales.

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*These figures are highly magnified, the hair lines at their sides approximating the natural lengths. 1, egg—natural size scarcely .01. 2, larva, as it appears when running over the twigs—natural length .01. 3, its appearance soon after becoming fixed. 4, appearance of scale after the second plate is formed. 5, form of louse (ventral view) soon after losing its members. 6, form of louse (ventral view) when full grown and just about to deposit. 7, fully formed scale, containing louse, as it appears from the underside, when raised. 8, highly magnified antenna of larva, showing joints.

June 9th.—The past two days have been exceedingly warm, the thermometer rising above 90 degrees F. in the shade, and the young lice are running all over the twigs.

June 11th.—They have all become fixed, having gathered in the greatest numbers around the base of the lateral shoots of the terminal twigs.

June 12th.—A white, waxy secretion commences to issue from the body, in the shape of very fine, delicate threads (see Fig. 3, 3).

June 22d.—They have increased materially in size, the waxy secretion vanishing soon after the last date, leaving what appears to be the body, of a yellowish brown color, though in reality the body is underneath and separate, and has lost all trace of members.

July 1st.—Though watched every day, there is no perceptible change since the 22d of June.

July 2d.—They are now 0.03 long, or three times as large as when hatched, and a thin, waxy secretion commences to appear at the posterior end.

July 6th.—This secretion has increased rapidly, and taken on a somewhat oval form, with usually a slight cut or depression posteriorly. It appears quite distinct from the original yellowish-brown portion, and is duller, or of a more grayish color. On raising it carefully, the louse is seen underneath; yellowish, of a flattened form, the anterior tapering more than the posterior portion, which latter is always distinguished by having a patch of bright reddish-brown (see Fig. 3, 5). Though from analogy it must have a beak of some kind, it is so exceedingly fine and fragile that I have never been able perceive it.

July 10th.—There seems to be another pause in the growth, the scale presenting the appearance of Figure 3, 4.

July 12th.—A third plate or secretion has commenced from the posterior portion.

July 15th.—This last plate enlarges rapidly, and is the exact color of the bark.

July 20th.—The three plates are at present readily distinguished; the last, which is considerably larger than the two others together, having usually taken a slight curve, which gives the scale its characteristic form.

August 1st.—Their growth is to all appearances completed, the scale measuring 0.12, while the louse measure but 0.05, occupying thus about half the space within. The three different growths are now not readily distinguished, though the narrow end is always reddish-brown. On lifting the scale the insect does not fall out, being retained by a slight whitish fringe extending from each side of the scale (see Fig. 3, 7).

August 12th.—Some of them have commenced to deposit eggs.

August 28th.—The eggs are now, apparently, all deposited, and I have watched with interest, as the deposition went on, the body of the parent louse shrinking day by day, instead of extending and becoming gravid, until it is now a mere atom at the anterior or narrow end of the scale, in a few days scarcely to be noticed at all.

The oyster-shell bark-louse produces but one brood annually, and these eggs, therefore, remain under the scales for more than nine months of the year, subjected alike to the continuous warmth of the fall months, and to the severe frosts of winter; freezing and thawing again and again, without their vitality being in the least impaired. In order to show the conclusions which I came to, after the above observations, I will, in a measure repeat them.

All writers on this Bark-louse, copying after Fitch and others, tell you that the scale you see on your trees is the gravid body of the female insect. Now, though for aught I know the body proper of the female may, in some Coccidan species, extend and cover the eggs she deposits, it is no such thing in this instance; and I am prepared to affirm that the scale is no more the insect's gravid body than is the empty muscle shell the distended outer membrane of the muscle, or the oyster shell that of the oyster.

How this scale is formed I do not profess to have discovered. With regard to our native white species, already referred to (p. 7), Mr. Walsh, in the Practical Entomologist for December last, refutes Harris's theory, namely, that it is formed in the same way as the down which exudes from other lice, and shows, with some plausibility, that it may consist of the cast-off skins of the insect. Now, in my own humble opinion, with the imported species under consideration, I am inclined to uphold Harris, for the following reasons: besides the fine waxy filaments which it secretes when becoming fixed, I have found that, even before these are thrown out, it is covered with a fine, white bloom, proving that it can and does secrete from the general surface; having carefully lifted the scale, every day during the growth of the third portion referred to, the louse has invariably been found in the same shape and condition, without apparent connection with it, while the scale, to all appearances, actually increases in bulk during the time the eggs are being deposited. Furthermore, the exuviæ of such a tiny insect would be infinitely thinner and more delicate than is the scale, and as the insections, especially of the verter, are always plainly visible with a glass, in the louse, we should expect to see them in the scale, which is, however, perfectly smooth. Again, the louse is of the same color throughout its growth, while at one time the three parts of the scale are perceptibly different in this respect. Moreover, Reaumur long ago (Memoires, tom. IV., p. 26) observed a species occurring on the peach in France to cast its skin in flakes, much in the manner as many of our *Dipterous* and *Hymenopterous* larvæ are known to do; while he also described a species (pp. 64, 65, ibid.) occuring on the vine, which covered its eggs with a white, gummy, cottony secretion; and Mr. Walsh himself, in the February number of the little monthly already referred to, p. 57, speaking of a species occurring on the under surface of the leaves of the *Olea* *fragrans*, shows how in that species the "scale" is not formed of the lifeless body of the female, but is a distinct integument, constructed by the female to protect herself and her eggs, and probably *secreted from the general surface of the body.*

However, I believe that the entomologist will have about as difficult a task to ascertain its real mode of growth as would the physiologist to learn how the flesh on your fingers acquires its natural form. We might with equal reason try to learn why and how the thousand different excrescences and galls caused by insects are formed! Why is it that the larva hatching from an egg deposited on a rose leaf by a little four-winged fly, the *Rhodites ignota* of Osten Sacken, causes a peculiar growth or gall in the form of a mangel-wurzel, or beet seed, to surround it, while that of a similar fly, belonging to the very same genus—the *Rhodites radicum* of Osten Sacken—hatched from eggs deposited in the root of the same plant, causes an entirely different gall? Why is it that the puncture of a little yellow louse, *Pemphigus* (?) *vitifoliæ*, Fitch (or as Henry Shimer, of Mt. Carroll, would have it, *Daktylosphæra vitifoliæ*), by puncturing a grape leaf, causes an unnatural growth to surround and entomb it in the shape of the little green globular galls of different sizes, so common on Clinton grape vines, while the same sized puncture of another louse (*Aphis vitis*, Scopoli) produces no such effect? Why, again, does a little Lepidopterous larva, often found in the golden rod (the larva of *Gelechia gallæsolidaginis*, described in a future chapter of this report), produce an elongated hollow gall, while a Dipterous larva (*Trypeta solidaginis*, Fitch), in a neighboring stalk produces one that is round and solid? Or, lastly, why should the suction of different species of Dipterous larvæ (*Cecidomyiæ*), produce the wonderful galls found on our willows, causing in many instances not only a total change in the texture of the leaf, but also in its mode of growth?

To me the formation of our Bark-louse scale appears somewhat analagous to all of these, and a thousand other such phenomena known to science; and in answering how such growths, peculiar to each species, are formed, or why each is so constant in its character, I can only say that it is their nature; or, with Devere, "that knowledge of first causes belongs to Him alone, who allows the eye of man to see final causes only." The more we endeavor to study the why and the wherefore of these things the more the mind is filled with the idea of Infinity, and escaping from all visible impressions of space and time rises to sublimest contemplation of the Creator.

The growth of the scale under consideration, to my mind, depends no more on the will of the louse underneath it than does the sponge on that of the slimy, jelly-like creature which secretes it, or the coral on that of its polype; or, to use a more patent illustration, than the growth of our bones, though secreted from our organs, depends on our will.

By carefully lifting one of these scales during the months of July and August, any of you may find the true louse underneath, occupying but a portion of, and being quite separate from it.

From analogy we may presume that there are males as well as females of this species, since winged males are known to occur in the genus *Aspidiotus*, and it has been my great aim and hope to discover this gentleman. Though an extremely small percentage of the scales may generally be found dwarfed and empty during the first days of August, suggesting that a male may have escaped, yet as likely as not these may have been killed by some cause or other. In the latter part of June I counted five hundred scales on a single twig, and marked them to prevent mistake or confusion in recognizing them again. After watching them steadily, and carefully lifting each one on the 28th of August, they all, with the exception of two, were found to contain eggs. The same average would doubtless have been found over the whole tree; and from this fact I am constrained to believe that as a rule no males appear, and that if there be exceptions where they do occur, they are in such proportion as to be of little avail. Mr. Shimer, in speaking of the Clinton grape gall, already alluded to, states that he opened thousands of them before he found a male; and it is difficult to conceive what effect a single delicate male, shut up in a gall, could have on the thousands of others not dignified by his presence. When we reflect on the abnormities occurring among our plant-lice, I see no reason why our bark-lice should not be hermaphrodite as a rule, and yet occasionally produce males. They are still lower in the scale of Nature than the plant-lice, and one of them—the celebrated Cochineal—puzzled naturalists a long time as to whether it was a plant or an animal. There is in fact so much of the anomalous about this family that it furnishes a rich and interesting field of study.

The observations of both, Mr. Shimer, Mr. Walsh, and myself agreed as to the time of hatching; as to the mode of growth of the scale, and as to finding no females; but as to the process by which the scale was formed there was difference of opinion. The reason, it seems to me, is obvious enough: in attempting to elucidate the problem we reach beyond the limits of our power of perception into the realms of conjecture. It is easy enough to watch the mode of growth of an oak-apple, but it is not such an easy matter to ascertain the reason why the kind which occurs on the red oak (produced by *Cynips quercus-inanis*) should form inside with radiating spokes from a common central cell; while that on the black oak (produced by *Cynips quercus-spongifica*) should form inside with a dense spongy substance around a similar central cell. Mr. Shimer may, in part, be right in stating that the larval scale is formed by the young louse shedding its skin; but the extremely fine skin alone would not form such a scale, and he strangely overlooks the wax-like filaments secreted from the general surface of the body as well as the peculiar distinction in the growth of the "medial" and "anal" sacks. That these two last scales are *constructed* by the louse, of its own cast skins and some excrementitious secretion, as he suggests, is also made *extremely* doubtful, from the simple fact that you may raise them every day of their growth and find the louse underneath, entirely free and separate. But after all, though of great scientific interest this matter is of no practical importance whatever, for as we shall see hereafter the great point to be borne in mind, in a practical light, is the time of hatching of the egg.

As the female Bark-louse is only capable of motion for a period of from two to three days at the most, after which time she becomes as permanently fixed for the rest of her life as is the tree on which she is fastened; and as the winged males (even if they ever exist) could not assist in the spread of the species, it may puzzle some to divine how this insect spreads from tree to tree and place to place. That it is transported to distant places, mainly on young trees, there can be no doubt, and there are various ways in which it can spread from tree to tree in the same orchard, though it can only thus spread during the few days of its active larval state. Mr. Walsh believes that the only way, as a general rule, that it can spread from tree to tree, when the boughs of those trees do not absolutely interlock, is by a few of these active young larvæ, crawling accidentally on to the legs of some bird, that chances to light on one tree and afterwards flies to another, and he even goes so far as to say that he believes this Bark-louse would soon cease to exist, if all the birds in the world were killed off (Rep. p. 41). My friend Walsh seems to have a special grudge against the birds, and it is hard to imagine how he could make such a statement, in face of the fact that where there is one bird, there are a hundred insects roaming constantly from tree to tree, that are just as capable of giving the young lice a lift. Moreover the specific gravity of the young louse is so slight that it almost floats in the air, and is undoubtedly aided in spreading by the winds; while on a tree very thickly covered with old scales, its traveling propensities are sufficiently developed to cause it to run down the trunk of the tree and *even over the ground*, and as it travels at the rate of two or three inches per minute, it could manage to measure several rods with its microscopic legs, in the course of its active state.

Though essentially belonging to the apple tree, this Muscle-shaped bark-louse is not unfrequently found both upon the Currant, the Plum and the Pear. I have seen the scales fully developed and bearing healthy eggs *on the fruit* of the White Doyenne pear, of the Transcendent crab, and of the wild plum (*Prunus Americana*) which have been sent to me by Mr. T. D. Plumb, of the State Journal, Madison, Wisconsin; and, though on the hard bark of a tree, we cannot judge of the amount of sap they absorb, it is quite apparent on these soft fruits, for each scale causes a considerable depression from the general surface. I have also received twigs of the Persian lilac from

F. Starr, of Alton, Illinois, covered with a species, which, if not the same, is exceedingly like it.

Natural Remedies.—It was last year simultaneously discovered by Mr. Walsh and Mr. Shimer, that a species of mite (*Acarus* family) preyed unmercifully on the louse as well as on its eggs. This mite was described by Mr. Shimer as *Acarus malus* in the paper already referred to, and it appears that it greatly resembles the young bark-lice. Mites are not true insects, but belong to the same class (*Arachnida*) to which our spiders belong, and although the species are numerous—some causing galls on plants, some living externally on vegetable substances and seeds, either in a sound or rotten condition, others devouring animal substances, both dead and living, while others again are parasitic on certain animals—yet they all are readily distinguished in the perfect state from true insects by having four pairs of legs, and by the head and thorax being soldered in one piece without any joint whatever. Some of them, in the larval state, have but six legs, thus still more closely mimicking the young bark-lice, but they all acquire eight in the full grown state. This mite, so insignificant that in the larval state it can only be noticed by careful watching with a pocket-lens, has, doubtless, done more to save the apple trees in the Northern States than any one thing else; and its existence explains the gradual decrease of the Bark-louse that is known to have occurred in many orchards, and also accounts for its entire extermination on certain trees.

Fig. 4.

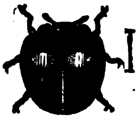
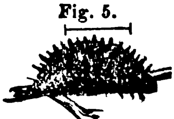


Fig. 5.



The next most efficient aid we have is the Twice-stabbed lady-bird (*Chilocorus bivulnerus*, Muls.) This good friend is readily recognized by its polished black color, and the blood-red spot on each wing-case. It is represented magnified at Figure 4, the hair line at the side showing the natural length. Its larva (Fig. 5) is a dark gray prickly affair, and is extremely active and voracious. In changing to pupa, the larval skin splits open on the back, but the naked pupa, which is of the color of burnt-umber with lighter sides, remains within it as if for protection. In this latter state these lady-birds may often be found fastened in clusters of from six to twenty on apple trees affected with either kind of bark-louse, and they should invariably be protected. It is astonishing how rapidly they will cleanse a tree from its vermin, and there is no better way of getting rid of bark-lice than by introducing a few of these little friends onto the lousy tree.

Artificial Remedies.—These may be summed up in a very few words, and consist, for the most part, in prevention, and I again urge a strict examination of every young tree before it is planted. If an orchard is once attacked before its owner is aware of it, much could be done on young tress by scraping the scales off in winter, but on large trees where it is difficult to reach all the terminal twigs, this method becomes altogether impracticable, and it will avail but little to cleanse the trunk alone, as most of the scales containing living eggs will be found on the terminal branches. Alkaline washes, and all other washes, except those of an oily nature, such as petroleum or kerosene, are of no avail when applied to the scales, for the simple reason that they do not penetrate and reach the eggs which are so well protected by these scales; and it is very doubtful whether any solution can be used that is sufficiently oily to penetrate the scales and kill the eggs without injuring the tree, especially while the sap of the tree is inactive. Hence, this Bark-louse can only be successfully fought at the time the eggs are hatching, and the young lice are crawling over the limbs. The time of year in which this occurs has already been indicated, and the trees should be closely watched during the last days of May and the first days of June, for, without close scrutiny, they will not be observed, appearing simply like very minute, white, moving specks. While the young larvæ are thus crawling over the tree, they are so tender that they can be readily destroyed by simply scrubbing the limbs with a stiff brush. It it quite evident, however, that any remedy, to become practicable on a large scale, so as to rapidly and effectually reach every limb of the tree, both large and small, must be applied by a syringe or by means of fumigation, and that whatever be applied, it must kill the lice without injuring the foliage or fruit, as the young apples are generally as large as a good sized pea by the time the lice hatch. Fumigation has not yet been sufficiently tried to enable us to judge of its merits. A correspondent of the *Prairie Farmer*, in recommending brimstone, gives the following as his plan of using it: "My plan is to cover the entire tree with cloth, so that there are no holes to let out the smoke; take an iron dish—a frying pan with a handle, if you please—put in about one pound of roll brimstone (not sulphur), heat a chunk of iron red hot—say a clock weight; drop the iron upon the brimstone, and put it under the tent cloth, where it should remain long enough to fairly smudge the whole tree. More brimstone can be added, and the iron repeated as often as desired, probably five minutes to a tree would be sufficient, more would do no harm. The cloth can be easily taken off and put on by two operators, each with a light pole with a spike in the end. The one pound of brimstone will burn about an hour." Having had no bark lice on which to try the above experiment, I wrote to the party recommending it, and as I received no answer, the experiment probably failed or was never tried. The brimstone would doubtless injure the tree.

Mr. A. R. Whitney, of Franklin Grove, Lee county, Illinois, whose apple trees have been troubled more or less with bark lice, found that an application of sheep manure around the trees, had a beneficial effect in checking the pests, and he attributes the result to the ammonia arising from the manure. With regard to washes, to be used with a syringe, the late Dr. Jno. A. Kennicott used 1 lb. of sal soda to one gallon of water with good effect; it is best used by heating to redness in an iron pot and then dissolving it in the water. Mr. E. G. Mygatt, of Richmond, McHenry county, Illinois, has experimented with this insect for over 20 years with the following result: Brine (2 quarts salt to 8 of water) kills the lice, but also the foliage and fruit. Tobacco water (strong decoction) neither injures the foliage nor affects the lice. A solution of cobalt kills the lice, but takes the foliage also. Weak lye kills the lice, but also somewhat affects the leaves. Lime water kills about half the lice, and affects the leaves a little. Finally, quassia, boiled in proportion of 1 pound to 3 gallons of water, though well known to be effectual for the common plant-lice, has no effect on these coccids. In short, we have abundant proof that neither tobacco-water nor strong alkaline washes have any effect on these young lice, though a strong solution of soap *will* kill them, and my experience the past season, with cresylic acid soap in other directions, leads me to strongly recommend it for this purpose. It will sometimes be necessary to repeat the wash, as the lice do not all hatch out the same day, though the period of hatching seldom extends over three days.

From the foregoing it is obvious that bark-lice can only be successfully fought during three or four days of the year: how absurd and ridiculous then, are all the patent nostrums and compounds which are continuously offered to the public as perfect "bark-lice extinguishers," and which never mention this most important fact. May this insight into the history of the Apple tree Bark lice, prevent many a man from being swindled out of his time and money by these impostors!

THE PERIODICAL CICADA.

(Homoptera Cicadidæ.)

SEVENTEEN AND THIRTEEN YEAR BROODS.

The year 1868 will long be remembered in the annals of insect life, as one of peculiar interest, from the fact that this singular Cicada (*Cicada septemdecim*, Linn.) popularly known as the "17-year locust," made its appearance very generally over the United States.

The metamorphoses of insects, their instructive industry, their quarrels and their instincts, afford abundant food for our love of the marvelous; but few of them can claim such a singular history as can our Periodical Cicada. We are moved to admiration in contemplating the fact that an insect, after living for 17 long years in the bowels of the earth, should at last change its sluggish, creeping and worm-like form, and, endowed with the power of flight, ascend from its earthy retreat to become a denizen of the air and to enjoy the full glory of the Sun. But our wonder increases when we reflect that this same insect has appeared in some part or other of the United States at regular intervals of 17 years, for centuries, aye! for ages in the past. Long ere Columbus trod on American soil this lowly insect must have appeared regularly at its appointed time. It must have filled the woods with its rattling song, when none but wild beasts and savages were present to hear it. To me there is something beautiful in the idea that through its periodicity we are enabled with tolerable certainty to go back in thought, for centuries in the past, to a particular month of a particular year, when the woods resounded with its song in the same manner as they did last summer; for so regularly do the different broods appear, that one is perfectly warranted in the assumption, that in the month of June, in the year 1738, for instance, 130 years ago—they appeared in the southern part of Missouri, and that 6 years previously they had appeared in the northwestern corner of the same State.

Though so much had hitherto been written about this Cicada, yet some of the most interesting facts with regard to it were unknown till the past season. A very complete article on the subject was published in the December number of the AMERICAN ENTOMOLOGIST, which I shall for the most part repeat, and render more complete by the addition of some facts as to their distribution, which were contained in some unpublished manuscript of the late Dr. Gideon B. Smith, of Baltimore, Md., and which were comunnicated to me through the kindness of Dr. J. G. Morris of the same city.

It was my good fortune to discover that besides the 17-year broods, the appearance of one of which was recorded as long ago as 1633, there are also 13-year broods;* and that, though both sometimes occur in the same States, yet, in general terms, the 17-year broods may be said to belong to the Northern, and the 13-year broods to the Southern States, the dividing line being about latitude 38°, though in some places the 17-year brood extends below this line, while in Illinois the 13-year brood runs up considerably beyond it. It was also exceedingly gratifying to find, four months after I had published this fact, that the same discovery had been made years before by Dr. Smith, though it had never been given to the world.

It so happened that one of the largest 17-year broods, together with one of the largest 13-year broods, appeared simultaneously in the summer of 1868. Such an event, so far as regards these two particular broods, has not taken place since the year 1647, nor will it take place again till the year 2089.

There are absolutely no perceptible specific differences between the 17-year and the 13-year broods, other than in the time of maturing; but whether or not, scientifically speaking, they are to be considered as specifically distinct, the 13-year brood may, for convenience sake, be called *Cicada tredecim*, in contradistinction to *Cicada septemdecim*, the 17 year brood. Mr. Walsh informs me that Charles Darwin, Prof. Asa Gray, and Dr. Hooker all agree in the belief that the 17-year and the 13-year forms ought not to be ranked as distinct species, unless other differences besides the period of development could be discovered, the mere rarity of variability in such a point not being sufficient.

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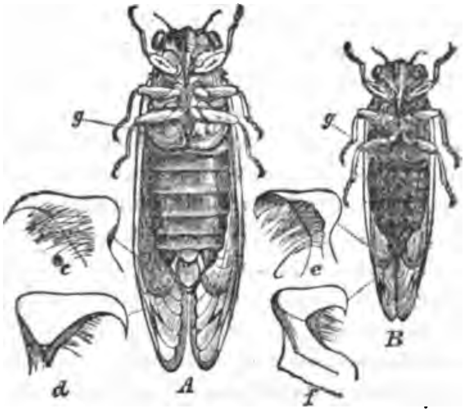
* See *Journal of Agriculture*, St. Louis, June 13, 1868, in which appeared the first account ever published of such a brood.

TWO DISTINCT FORMS.

It is not a little singular, also, that two distinct forms occur in both broods—a large one and a small one—the former by far more numerous than the latter. This fact has been observed in past years, and was noticed the present year by independent observers in different parts of the country.† Indeed, it was observed by Dr. Hildreth, of Marietta, Ohio, as far back as 1830 (vide Silliman's Journal XVIII, p. 47). The true *Cicada septemdecim* of Linnæus (Fig. 6 *A*, ventral view of male), as described by Harris and Fitch, occurs in the greatest numbers, both in the 17 and 13-year broods. It will measure, on an average, one and a half inches from the head to tip of the closed wings, and almost always expands over three inches. The whole under side of the abdomen is of a dull orange-brown color, and in the male more especially, four or five of the segments are edged with the same color on the back.

[Fig 6.]



The other form (Fig. 6 *B*, ventral view of male) is not, on an average, much more than two-thirds as large, and usually lacks entirely the dull orange abdominal marks, though there is sometimes a faint trace of them on the edges of the segments beneath. This small form was described in 1851, by Dr. J. C. Fisher, in the Proceedings of the "Philadelphia Academy of Natural Sciences," Vol. V, pp. 272-3, as a new species of

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† 1. Mr. V. T. Chambers, in the August number of the "American Naturalist," p. 332, is said to point out some variation in color from those described by Dr. Fitch.

2. Mr. S. S. Rathvon favored me with specimens of both species from Lancaster county, Pa., accompanied with the following: "I am justified, I think, in concluding these are two distinct species. They are different in size and coloration, produce entirely different stridulation, do not cohabit indiscriminately," etc.

3. The correspondent to the Department of Agriculture (July Rep.) from Hematite, Mo., says: "There are two species, one (both male and female) about twice the size of the other, and differing greatly, also, in their cries and actions."

Cicada, hitherto confounded with *septemdecim*, and was named *Cicada cassinii*. His description was followed by a note from Mr. John Cassin, in which he states that the two forms show no disposition to associate together, and produce very different cries. The fact of the very great difference in the song of the males has been fully confirmed by the observations of M. C. Hill, of Northeast Ohio, who likewise found that the small form is very much less numerous than the large one.

The truest test of the specific distinction of these two forms lies in the comparative shape of the male genital hooks, and on submitting specimens of both forms to Dr. H. Hagen, of Cambridge, Mass., formerly of Köenigsburg, Prussia, he very kindly furnished the drawings *c*, *d*, *e*, and *f*, in Figure 6, which show the male genital hooks of both. That of *septemdecim* is represented on the outside at *c*, on the inside at *d*; and that of *cassinii* on the outside at *e*, and on the inside at *f*.

By these figures, it will be seen that there are sufficient differences to separate the two forms as distinct; but while the hooks of the large kind (*septemdecim*) are quite constant in their appearances those of the smaller kind (*cassinii*) are variable, and in some few specimens are undistinguishable from those of the large kind. This circumstance, coupled with the fact that the small kind regularly occurs with both the 17 and 13-year broods, would indicate it to be a dimorphous form of the larger, or true periodical species; especially when we consider that dimorphism and heteromorphism are not uncommon among the true Bugs (HEMIPTERA). Mr. P. R. Uhler, of Baltimore, Md., who has given this order of insects particular attention, informs me that he is not fully satisfied of the specific distinctness of *C. cassinii*; but Dr. Hagen thinks there is no possible doubt of its being distinct, for the simple reasons, as he states, that dimorphism occurs only in one sex, while here both sexes are involved; that *cassinii* appears later, makes a different noise, has different colors and was never seen to copulate with *septemdecim*. To use Dr. Hagen's own words, "what more is needed to make a distinct species, if one kind of Cicada requires 17 years to undergo its transformations, why not a second kind?" I find among a great number of specimen, which I have examined, that not only do the hooks of *cassinii* vary, but the other characters that have been mentioned as belonging to it, are variable, there being perfectly intermediate grades between its extreme type and that of *septemdecim*. Again, on the supposition that it is a distinct species, the chances are extremely small, of its issuing together with *septemdecim* in the *same* year in the many different localities hereafter mentioned. Therefore, though it will be convenient to use the two names, I think the two forms should not be ranked as distinct. But the discussion of the subject would involve the general problem of specific character.

The large species has been observed to make its appearance from eight to ten days earlier than the small species (*cassinii*), and there is not a single specimen of the latter, among a number of the 13-year brood (*tredecim*) that I captured in May, though I took a few specimens afterwards.

THE SEASON OF THEIR APPEARANCE AND DISAPPEARANCE

differs somewhat with the latitude, though not so materially as one might suppose. According to the records, they appeared the past season earlier in the South than in the North; but the last half of May can be set down as the period during which they emerge from the ground, in any part of the country, while they generally leave by the 4th of July. In St. Louis county the past season they commenced issuing on the 22d of May, and by the 28th of the same month, the woods resounded with the rattling concourse of the perfect insect. As is the case with a great many other insects, the males make their appearance several days before the females, and also disappear sooner. Hence in the latter part of the Cicada season, though the woods are still full of females, the song of but very few males will be heard.

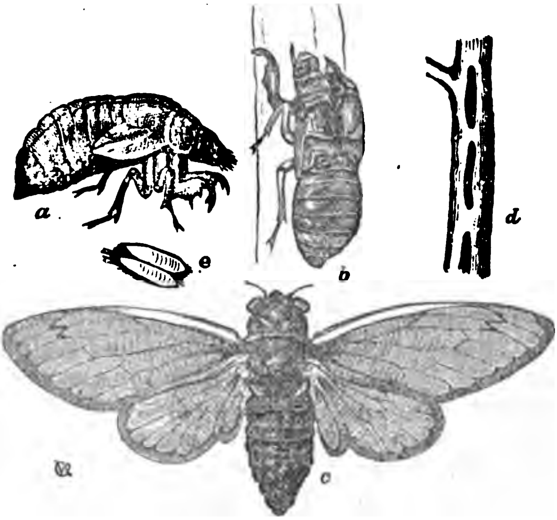
That circumstances favorable or otherwise may accelerate or retard their devolopment, was accidently proven, the past season, by Dr. E. S. Hull, of Alton, Illinois; as by constructing underground flues, for the purpose of forcing vegetables, he also caused the Cicadas to issue as early as the 20th of March, and at consecutive periods afterwards, till May, though strange to say these premature individuals did not sing. They frequently appear in small numbers, and more rarely in large numbers, the year before or the year after their proper period. This is more especially the case with the 13-year brood. Thus in Madison county in Illinois, and in Daviess and Clark counties in Missouri, there were in 1854 a few precursors to the true 1855 brood. They were also observed in Madison county, Illinois, in 1867; while "L. W." writing from Guntersville, Alabama, to the *Country Gentlemen* of June 25, 1868, says, "some call them 14-year locusts." Other such cases will be noticed hereafter.

THEIR NATURAL HISTORY AND TRANSFORMATIONS

have been sufficiently described in the standard works of both Harris and Fitch, and it is only necessary to mention a few facts not recorded by them.

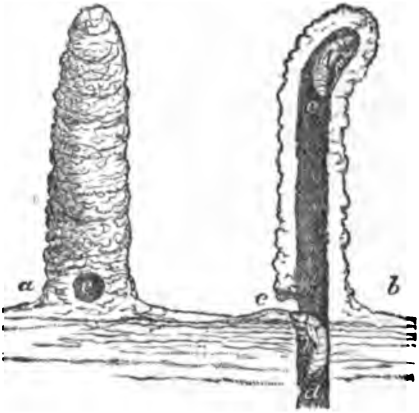
Mr. S. S. Rathvon, of Lancaster, Pa., who has himself witnessed four of their periodical visits, at intervals of 17 years, discovered the following very ingenious provision which the pupæ (Fig. 7, *a*) made the past season, in localities that were low or flat, and in which the drainage was imperfect. He says: "We had a series of heavy rains here about the time of their first appearance, and in such places and under such circumstances, the pupas would continue their galleries from four to six inches above ground (Fig. 8, *a* full view, *b* sectional

[Fig. 7.]



view), leaving an orifice of egress even with the surface (Fig. 8, *e*).—In the upper end of these chambers the pupas would be found awaiting their approaching time of change (Fig. 8, *c*). They would then back down to below the level of the earth, as at *d*, and issuing forth from the orifice, would attach themselves to the first object at hand and undergo their transformations in the usual manner." Mr. Rathvon kindly furnished me with one of these elevated chambers, from which the above drawings were taken. It measured about four inches in length, with a diameter on the inside of five-eighths of an inch, and on the outside of about one and a quarter inches. It was slightly bent at the top and sufficiently hard to carry through the mail without breaking. The inside was roughened with the imprints of the spines with which the fore legs of the builder are armed. In a field that was being ploughed near St. Louis, about the time of their ascent, I found that single, straight or bent chambers were the most common, though there were sometimes several branching near the surface from a main chamber below, each of the branches containing a pupa. The same observations have been made by other parties. These holes are cylindrical and are evidently made by oppressing the earth on all sides and throwing the refuse to the bottom, which must be quite a feat when they penetrate hard roads or come up between two rocks as they frequently do.

[Fig. 8.]



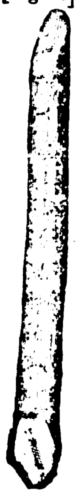
The larvæ are frequently found at a great depth, nothwithstanding its denial. Thus Mr. Henry Sadorus of Port Byron, Illinois, who built a house in 1853, found that they came up through the bottom of his cellar in 1854, the cellar being over five feet deep, and Mr. F. Guy of Sulphur Springs informed me that he had found them at a depth of ten feet below the surface.

When ready to transform they invariably attach themselves to some object, and, after the fly has evolved, the pupa skin is left still adhering, as shown at Figure 7 *b*. The operation of emerging from the pupa most generally takes place between the hours of 6 and 9 P. M.; and ten minutes after the pupa skin bursts on the back the Cicada will have entirely freed itself from it. Immediately after leaving the pupa skin, the body is soft and white, with the exception of a black patch on the prothorax. The wings are developed in less than an hour, but the natural colors of the body are not acquired till several hours have elapsed. These recently developed Cicadas are somewhat dull for a day or so after transforming, but soon become more active, both in flight and song, as their muscles harden. For those who are not informed of the fact, I will state that the males alone are capable of "singing," and that they are true ventriloquists, their rattling noise being produced by a system of muscles in the lower part of the body, which work on the drums under the wings, shown in Figure 6, at *gg*, by alternately tightening and loosening them. The general noise, on approaching the infested woods, is a compromise between that of a distant threshing machine and a distant frog pond. That which they make when disturbed mimics a nest of young snakes or young birds under similar circumstances—a sort of scream. They can also produce a chirp somewhat like that of a cricket's, and a very loud shrill screech, prolonged for fifteen or twenty seconds, and gradually increasing in force and then decreasing.

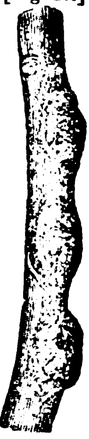
After pairing, the females deposit their eggs in the twigs of different trees; and though for this purpose they seem to prefer the oaks and the hickories, they oviposit in almost every kind of deciduous tree, and even in herbaceous plants, and in evergreens. We have seen their eggs in the Chestnut, Locust, Willow and Cottonwood, in peach twigs of not more than ⅛ inch diameter, and also in the stems of the common Eupatorium, while R. H. Warder, of Cleves, Ohio, has found them in the following evergreens: Thuja occidentalis, Juniperus virginiana and Abies canadensis, but was unable to find any traces of their work in either of our common pines—Pinus Austriaca, P. strobus or P. sylvestris.

Dr. Harris (*Inj. Ins.* p. 212) has well described the mode of depositing, and it is only necessary to add that the female always saws with her head upwards, *i. e.* towards the terminal part of the branch, except when she comes in contact with a side shoot, when, instead of

[Fig. 9.]



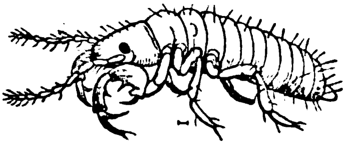
[Fig. 10.]



shifting a little to one side, she reverses her position, and makes two punctures in an opposite direction to the rest, and thus fills up the straight row close to the base of the side shoot. The eggs (Fig. 7 *e*) are of a pearl white color, one-twelfth of an inch long, and taper to an obtuse point at each end. They are deposited in pairs, but separated by a strip of wood, which is wider—and thus causes the eggs to be further apart—at the bottom of the grooves than at their commencement. The punctured twigs bear the appearance of Figure 9, and frequently break off and die, though the great majority remain green and recover from their wounds. Indeed, there is every reason to believe that the eggs seldom hatch in those twigs which break off and become dry, but that the life and moisture of the twig is essential to their life and development of the egg, for the eggs are noticeably larger just before hatching than when first deposited, showing that they are, to a certain extent, nourished by the living wood, as is the case with those of many Saw-flies. Mr. Rathvon has also recorded the fact that the Cicada eggs are always shriveled in twigs that are amputated by the Oak-pruner (*Stenocorus villosus*, Fabr.) In the healing of the punctured parts a knot usually forms over each puncture, and I represent, at Figure 10, a portion of an apple twig, sent to me by Mr. John P. McCartney, of Cameron, in Clinton county, and which was punctured in the year 1862. Though the wounds had so well healed on the outside, the grooves inside were not filled up, but still contained the minute glistening egg-shells, from which the young larvæ had escaped six years before.

The eggs hatch between the 20th of July and the 1st of August or in about six weeks after being deposited. The newly hatched larva (Fig. 11) differs considerably from the full grown larva, but principally in having much longer and distinctly 8-jointed antennæ.* It is quite active, and moves its antennæ as dexterously and as rapidly as does an ant. As soon as it has extricated itself from an exceedingly fine membrane, which still envelops it after it has left the egg,† our little Cicada drops deliberately to the ground; its specific gravity being so insignificant, that it falls through the air as gently and as softly as does a feather.

[Fig. 11.]



The cross veins near the tip end of the upper wings of the Periodical Cicada form a dusky zig-zag mark in the shape of a W. Some ignorant persons are silly enough to believe that this mark portends war. It occurs alike, though not to such a marked degree, on all other Cicadas, and if people must have an omen let them rather take the two W's for *warm weather*, and it will not be likely to disappoint them.

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*There is frequently a ninth joint partly developed.

†All young Grasshoppers and Katydids that I have ever hatched were invariably enveloped in a like membrane after leaving the egg, and until this is thrown off the young insect is awkward in its motions. In the case of the young Cicada, these fine membranes are usually left attached to the roughened orifice of their nidus, and thus form, together, a white glistening bunch.

ENEMIES OF THE CICADA.

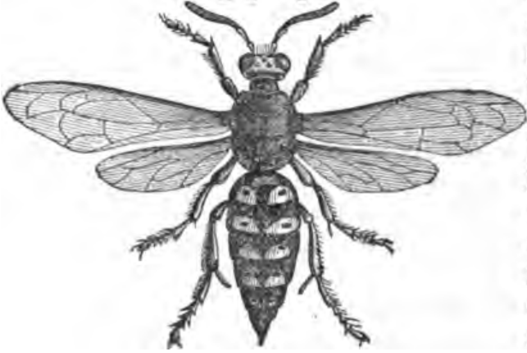
Upon leaving the ground to transform, the pupæ are attacked by different quadrupeds, by birds, by cannibal insects, such as Ground-beetles, Dragon-flies, Soldier-bugs, etc.; while hogs and poultry of all kinds greedily feast upon them. In the perfect fly state they are attacked by at least one insect parasite; for dipterous maggots (the larvæ, probably, of some Tachina fly) may occasionally be found in their bodies. In this state they are also often attacked by a peculiar fungus, which was first described by Dr. Leidy, in the Proceedings of the Philadelphia Academy of Natural Sciences for 1851. Dr. W. D. Hartman, of Westchester, Pa., speaking of the occurrence of this fungus, in 1851, says: "The posterior part of the abdomen, in a large number of male locusts, was filled by a greenish fungus. * * * The abdomen of the infected males was unusually inflated, dry and brittle, *and totally dead while the insect was yet flying about.* Upon breaking off the hind part of the abdomen, the dust-like spores would fly as from a small puff-ball." One male specimen received the present year from Pennsylvania was affected by the same, or a similar fungus, the internal parts of the abdomen being converted into what appeared to be a brown mould.

R. H. Warder, of Cleves, Ohio, in speaking of this mould says: It seemed to be a drying up of the contents and membranes of the abdomen, generally of a brown color, and dry and brittle. I found that in many cases the male organs of generation remained so firmly attached to the female during copulation that the male could only disengage himself by breaking away, leaving one or two posterior joints attached to the female, and it is these mutilated males which I found affected by the peculiar fungus mentioned, and therefore concluded that the "dry rot" might be the result of the broken membranes. I never found one thus affected in the very early part of their season, and I never found a perfect male thus affected. But this is not positive proof.

THE STING OF THE PERIODICAL CICADA.

It is astonishing what a wide-spread fear exists of the Cicada on account of its stinging powers. There is scarcely a paper in the United States but published some account of a "locust" sting last summer, while unpublished accounts were equally numerous. One of the editors of the St. Louis *Republican* was kind enough to clip out for me all accounts of such stings, which he found in their numerous exchanges, and the number which had accumulated, before the end of the "Locust" season, was truly surprising. Some people even denied themselves the pleasure of eating blackberries, raspberries and other fruits, because they feared these fruits had been poisoned by the eggs of Cicadas; while others believed that they poisoned water. I have endeavored to trace up a number of these reports, but have invariably found that they were either false or greatly exaggerated, and there is no doubt whatever that the great majority of such accounts owe their origin to the fertile imaginations of newspaper reporters, who are ever ready to create a sensation. Yet, to use a common metaphor, it is strange there should be so much smoke and no fire, and I will briefly review the only three methods by which such stinging can possibly be produced. At the same time, I give it as my conviction that there is but little cause for fear, as I have handled hundreds of them, and know hundreds of persons, including children, who have done the same, and yet have never been able myself to witness a single case of *bona fide* stinging,

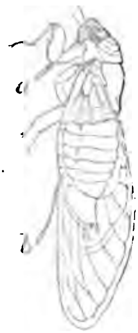
[Fig. 12.]



By Hornets.—There is a very large Digger wasp (*Stizus grandis*, Say), represented of the natural size in the accompanying Figure 12, whose peculiar habit it is to provision its nests with Cicadas. The burrows made by this Digger wasp, or hornet, are about three feet long, with two or three galleries about one foot long, each terminating in a chamber considerably enlarged. The female catches a Cicada which she stings and paralyzes, and drags into one of these chambers; and it is not very unlikely that she should occasionally alight on some human being with a Cicada in her grasp, and upon being brushed off, should retaliate by stinging the offender, and then fly off, leaving the Cicada behind, which, in absence of the hornet, would very naturally be accused of the sting. An allied species of Digger wasp (the *Stizus speciosus* of Say) has been actually observed, by Mr. Rathvon, to carry off a few belated individuals of the Periodical Cicada; but the usual prey of both these species is the larger annual Cicada (*C. pruinosa*, Say), and they both occur too late in the season to be the cause of all the stinging we hear of.

By the Ovipositor.—The ovipositor of the female (Fig. 13, *b*) is certainly capable of inflicting a wound, but the Cicada is anything but pugnacious, and when not in the act of ovipositing, this instrument is securely enclosed in its sheath. That this is the stinging instrument is rendered extremely doubtful, for the following reasons: 1st. All the stinging we hear of has been done suddenly, while the insertion of the ovipositor would necessarily be a gradual operation, requiring at least one minute; 2d. The real function of the ovipositor is to convey an egg into the wound which it makes, and I have been unable to trace a single case where eggs were found in the flesh. All such accounts have proved to be fabrications, and the straightforward report which Mr. V. T. Chambers, of Covington, Ky., gave inthe August number of the *American Naturalist*, of a negro being stung on the foot by a Cicada, proved, after all, to be a mistake, for "Mr. Winston did not see the insect with its instrument *in situ*;" 3d the three following facts, which are reliable, prove that stinging in the usual sense of the term, by this instrument is almost impossible: First, Mr. Wm. Muir, associate editor of Colman's *Rural World*, carefully lifted a female from off a tree, while she was yet in the act of ovipositing, and as carefully placed her on his little finger, holding it as near as possible in the same direction and position as the branch grew from which she was taken. She instinctively endeavored to continue ovipositing, and, holding firmly to his finger, tried again and again to insert the ovipositor, but without the least success, for it could not make the least impression on the soft and yielding flesh, but continually slipped from one side to the other. Second, it is recorded that Mr. Peter A. Brown, of Philadelphia, Pa., himself inflicted a puncture with the ovipositor, several times, upon his hand, without experiencing any more pain than that produced by a prick of a pin or any other pointed instrument, and that no swelling ensued; third, Dr. Hartman, of Pennsylvania, introduced some of the moisture from the ovipositor into an open wound and it caused no inflammation whatever.

[Fig. 13.]



By the Beak, or Haustellum.—The beak (Fig. 13, *a*) is an organ which both sexes of the Cicada possess, and by which they take their nourishment. I have seen them insert it into and extricate it from the branches of different trees, and know that the operation is quite rapid, and that the instrument must be quite sharp and strong. All the more authentic cases of stinging, indicate this to be the instrument,* and it is quite likely that, just as the sting of a bee will affect some persons nigh unto death, and have no effect whatever on others, so the puncture of the beak of a Cicada will be more serious with some than with others. That there is no poison gland attached to this beak, is no argument against its stinging power, for several true Bugs are known to produce severe stings by their beaks, while the hairs and spines of some caterpillars have a similar power.

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*Mr. D. B. Wier, of Lacon, Ills., who well knows the difference between the male and female Cicada, recollects distinctly, that when they were there in 1854, he was stung in the finger by the male, the sting not causing very severe pain.

Mr. R. T. Parker, of St. James, Phelps county, Mo., an intelligent fruit grower, who has given some time to the study of insects, informed me that he was stung on the neck by a male Cicada, evidently with the beak, and that the sting was not so painful as that of a bee.

Dr. M. M. Kenzie, of Centerville, Reynolds county, Mo., has communicated the fact that Frank Smith, aged 14 years, living on Henpeck, in the lower part of Reynolds county, was stung by a Cicada on the back of the left hand. The wound healed by first intention, and the next morning there was only a black clot, *about the size of a pin's head,* to mark its place, with scarcely any swelling.

THE INJURY WHICH CICADAS CAUSE TO FRUIT TREES.—REMEDIES.

While living under ground they have been accused of killing pear trees, and more especially by Miss Margaretta H. Morris, in accounts of them published in 1846. The late Dr. Smith, of Baltimore, however, who made extensive operations, denied their being capable of such injury. He says:

"The larva obtains its food from the small vegetable radicals that everywhere pervade the fertile earth. It takes its food from the surface of these roots, consisting of the moist exudation (like animal perspiration), for which purpose its rostrum or snout is provided with three exceedingly delicate capillaries or hairs which project from the tube of the snout, and sweep over the surface, gathering up the minute drops of moisture. This is its only food. The mode of taking it can be seen by a good glass."—*In Prairie Farmer, December*, 1851.

While they can, if they wish, insert their beaks into roots, and very likely do so in some cases, yet I incline to believe, that Dr. Smith's views are correct, for though Dr. Hull, of Alton, Illinois, has often found them firmly attached to different roots by the legs, he has never found the beaks inserted. The fact that they will rise from land which has been cleared of timber, cultivated, and even built upon for over a dozen years, certainly contravenes Miss Morris's statement, while their long subterranean existence precludes the necessity of rapid suction. It is also quite certain that if they thus killed trees, we should oftener hear of it, and I have captured a gigantic but unnamed species of Cicada on the plains of Colorado, 50 miles from any tree, other than a few scattering willows.

In the perfect state, however, the female is capable of doing great injury to trees by hacking up their twigs, in the process of depositing, and although their injury in the forest is not generally felt, it is a very different thing in our orchards, and especially in the nursery.

The following editorial from the old *Valley Farmer* of November, 1855, will show how serious the injury may sometimes be:

"We planted an orchard of the best varieties of apple trees last spring. We had taken particular pains, not only in selecting the best varieties, but in planting the trees, and hoped in a few years to partake of the fruit. But our hopes were destined to be blasted. The locusts during the summer destroyed nearly all of them; not one in six is living. To look at them one would think that some person had been drawing the teeth of a saw over the bark of every tree."

It also appears that in some instances they injure trees by the insertion of their beaks for nourishment, for Mr. Gustavus Pauls, of Eureka, had a young apricot tree which was so thoroughly punctured in this manner, that he took a gallon of coajulated sap from it, and he attributes the death of some of his trees to this cause. I am convinced, however, that the injury done in this manner is comparatively trifling.

On the 13th of June I was sent for by four different parties in St. Louis county, who wished me to try and save their trees from the ruinous work of these cicadas, which had by this time began to deposit their eggs in real earnest. I found that when the wind was high they could, by its aid, be driven to some extent, but that without its aid they could not be driven at all; as when started, they are just as likely to fly behind as before you. I tried lye, whitewash and sulphur, air-slacked lime and finally carbolic acid, and found that none of these mixtures would affect them. Indeed, after experiments involving about $200, I am convinced that there is no available way of entirely preventing this ruinous work when they once commence to deposit. The nursery of Mr. Stephen Partridge, a few miles west of St. Louis, which is surrounded on all sides by timber, was more seriously injured than any other which I saw, and he lost many hundred dollars' worth of apple, peach and pear stock. They also punctured his grape vines very freely, preferring the Clinton and Taylor among varieties. By having all hands turn out early in the morning, and between six and seven o'clock in the evening, while they hung listlessly to the branches, he succeeded in crushing thousands of them, and thus saved parts of his nursery from total ruin. But it becomes a hopeless task to try to stay their disastrous work when once they have acquired full power of flight; though, while in their feeble and helpless condition, as they leave the ground, they can not only be destroyed to far greater advantage by human agency, but hogs and poultry of all kinds, eagerly devour them. There were, it is true, many accounts afloat last summer of hogs being poisoned by them, and, though it is not impossible that one was occasionally killed by over-glutting,* such cases were very rare indeed. From the foregoing, the importance of knowing beforehand when to expect them becomes apparent, and the following chronological table, will not only prove of great scientific interest but of practical value. In the greater part of Missouri, the fruit grower may rest from all anxiety as to their appearance for thirteen years to come, but in the month of May, 1881, let him look out for them.

THEIR CHRONOLOGICAL HISTORY, WITH PREDICTIONS OF THE FUTURE APPEARANCE OF ALL WELL ASCERTAINED BROODS THROUGHOUT THE COUNTRY.

As nothing had been published up to A. D. 1868, as to the regular appearance of any thirteen year broods of Cicadas, it is not at all surprising that errors were committed by former writers on the subject. In the following chronology of this insects periodical visits, everything heretofore published has been revised as far as possible. The mass of facts from which the generalizations are made would be tedious if given in detail, and are therefore for the most part omitted. This chronology could not, of course, be made complete from a single season's researches, and it may even contain errors, but it will remain as a foundation for future work, and before another seventeen years shall have passed away, we may hope to have this part of the history of our curious Cicadas completed and perfected.

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* Mr. F. R. Allen, of Allenton, informs me that during years when the army worm (*Leucania unipunctata*, Haw.) occurred in such swarms, hogs and chickens feasted on them to such an extent that the former frequently died, while the latter laid eggs in which the parts naturally white would be entirely green when cooked.

While the discovery of the thirteen year broods, dispelled much of the fog in which this chronology had hitherto been wrapped, it at the same time, rendered a complete and lucid exposition of that chronology extremely difficult. The northern boundary line of the thirteen year broods is about latitude 37°, but in Illinois one of them ascends between two and three degrees above this line, while the seventeen year broods descend below it in several places, the two broods sometimes occupying the Carolina. Thus the two broods sometimes occupy the same territory; while two broods of the same kind, appearing in different years may also overlap one another, as in the instance given in the account of brood XXII in Virginia, where the "locusts" appear every eighth and ninth year. In order to make the subject as clear as possible, and to facilitate references, I have numbered the different broods of this insect in accordance with the date of their future appearance from and after the present year.

BROOD I.—*Septemdecim*—1852, 1869.

In the year 1869, and at intervals of seventeen years thereafter, they will, in all probability, appear in the valley of the Connecticut river. According to Dr. Asa Fitch (N. Y. Rep. I, p. 40), they appeared there in 1818 and 1835, and according to Dr. Smith they occurred in Franklin, Bristol and Hampshire counties, Massachusetts, in 1767, '84, 1801, '18, '35 and '52.

BROOD II.—*Tredecim*—1856, 1869.

In the year 1869, being the same as the preceding, they will in all probability appear in Georgia, in Habersham, Rabun? Muscogee, Jasper, Greene, Washington and adjacent counties, having appeared there in 1843 and 1856, according to Dr. Smith.

BROOD III.—*Septemdecim*—1853, 1870.

In the year 1870, and at intervals of seventeen years thereafter, they will in all probability appear in what is known as the "Kreitz Creek Valley" in York county, Pa., and possibly in Vinton county, Ohio, and Jo. Daviess county, Ills. Mr. S. S. Rathvon, of Lancaster, Pa., speaking of this brood, says: "Lancaster county is bounded on the southwest by the Susquehanna river, dividing it from the county of York, along the northeastern margin of which there is a mountain range, sloping down to the river. Along that slope Cicadas were abundant the present season (1868—Brood XXII). But on the southwest side of the range, in what is known as the Kreitz Creek Valley, there were none. They appeared last in this valley in 1853, and previous to that year at intervals of seventeen years from time immemorial." Dr. Smith records their appearance in 1853, both in Vinton county, Ohio, and Jo. Daviess county, Illinois.

BROOD IV.—*Tredecim*—1857, 1870.

In the year 1870, being the same as the preceding, they will in all probability appear in Jackson, Gadsden and Washington counties, Florida, having appeared there according to Dr. Smith in 1844 and 57.

BROOD V.—*Septemdecim*—1854, 1871.

In the year 1871, and at intervals of 17 years thereafter, they will in all probability appear around the head of Lake Michigan, extending as far east as the middle of the State of Michigan, and west an unknown distance into Iowa. Also in Walworth county and other portions of Southern Wisconsin, and southward into Illinois. This brood is equal to Dr. Fitch's 6th. It extends all over Northern Illinois, and as far south as Edgar county, and its appearance in 1837 and 1854 is well and thoroughly recorded. In Champaign county, Ills., it overlaps Brood XVIII, or the Southern Illinois *tredecim* brood, while it also interlocks with Brood XIII (*septemdecim*) in the same county.

They will also appear in the same years in the southeast by eastern part of Lancaster county, Pa., in what is called the "Pequea Valley," having appeared there in vast numbers in 1854.

The earliest known record we have of the appearance of periodical Cicadas, is in Morton's "Memorial," in which it is stated that they appeared at Plymouth, Plymouth county, Mass., in the year 1633.—Now, according to that date, one might be led to suppose that this recorded brood of Morton's belonged to this Brood III, as exactly 14 periods of 17 years will have elapsed between 1633 and 1871; but, strange to say, we have no other records of his brood than that in the "Memorial," whereas there are abundant records of their appearing one year later in the same locality, ever since 1787. There is therefore good reason to believe that the visit recorded by Morton was a premature one, and that it was properly due in 1634. I have therefore placed it in Brood XIII, and have little doubt but that if records could be found, these would prove the Cicadas to have appeared in 1651, 1668, 1685, 1702, 1719, 1736, 1753, and 1770, as they did in 1787, 1804, 1821, 1838, and 1855.

BROOD VI.—*Tredecim*—1858, 1871.

In the year 1871, being the same year as the preceding, and at intervals of 13 years thereafter, they will in all probability appear in the extreme southwestern corner of Mississippi, and in the adjoining part of Louisiana. Dr. D. L. Phares of Newtonia (near Woodville), Miss., says that in 1858 they extended over most of Wilkinson and part of Amite counties, Mississippi, and East and West Feliciana, La. He has himself witnessed the appearance of this brood during the years 1832, 1845 and 1858, while it is distinctly remembered by aged people in his neighborhood as having also appeared there in the years 1806 and 1819. Dr. Smith gives their range from the Mississippi river, east to a ridge 45 miles from the river that divides the State, north and south, and north and south to the boundaries of the State; recording them as occurring in 1806, '19, '32, '45 and '58.

BROOD VII.—*Tredecim*—1859, 1872.

In the year 1872, and at intervals of 13 years thereafter, they will in all probability appear in Jackson county and around Cobden and Jonesboro, in Union county, South Illinois, in Kansas, Missouri, Georgia, Louisiana, Tennessee and Mississippi.

According to Mr. Paul Frick of Jonesboro, they were in Union county, Ills., in 1858, and he also thinks it was a great year for them *about* 1832. Those of 1858 were probably premature stragglers of the 1859 brood, while Mr. Frick is most likely mistaken as to the year 1832, since the Rev. George W. Ferrell of Cobden, Union county, witnessed their appearance at that place in 1833, and also in 1846 and 1859; and Cyrus Thomas has also recorded their appearance in 1859 in the 5th Rep. of the Ills. State Agr. Soc., p. 458*, while a paragraph in the Baltimore (Md.) *Sun* of June 13, 1859 says "the locusts have made their appearance in 'Egypt' in Southern Illinois, and cover woods and orchards in swarms." This brood not improbably extends westward into Missouri, for several of the old settlers around Eureka, in St. Louis county, Mo., recollect it being "locust year" about the time of its last appearance, while Mr. L. D. Votaw of Eureka, and Wm. Muir of Fox Creek, Mo., both believe it was exactly 9 years ago, or in the year 1859. Dr. Smith records it in DeKalb, Gwinnett and Newton counties, Georgia, in 1846 and '59; in the northern part of Tennessee also, in 1846 and '59; in the whole eastern portion of Mississippi from the ridge which is 45 miles from the river, on the west, to the eastern boundary, in 1820, '33, '46, and '59; in Carrol Parish, Louisiana, in 1859; and in Philips county, Kansas, in the same year.

By referring to Brood XV, it will be seen that in 1846, or during the first year of the Mexican war, this 13-year brood appeared simultaneously with a 17-year brood in western Pennsylvania and Ohio.

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* If Mr. Paul Frick is correct, the brood he has witnessed may possibly be a detachment of the Mississippi and Louisiana Brood VI; in which case the Cicadas appear for two consecutive years in Union county, Ills., as they do (See Broods XIII and XIV) in Central Ohio, and portions of Northwestern Missouri.

BROOD VIII.—*Septemdecim*—1855, 1872.

In the year 1872, being the same year as the preceding, and at intervals of 17 years thereafter, they will, in all probability, appear in the southeastern part of Massachusetts; across Long Island; along the Atlantic coast to Chesapeake Bay, and up the Susquehanna at least as far as to Carlisle in Pennsylvania; also, in Kentucky, at Kanawha in Virginia, and Gallipolis, Ohio, on the Ohio river. This is the brood referred to in Brood V, and which there is every reason to believe is the one recorded by Morton in his "Memorial," as occurring in 1633.

Dr. Fitch, in the account of his 3d brood (N. Y. Rep. I, p. 39), says: "The third brood appears to have the most extensive geographical range. From the southeastern part of Massachusetts, it extends across Long Island, and along the Atlantic coast to Chesapeake Bay, and up the Susquehanna at least as far as to Carlisle in Pennsylvania; and it probably reaches continuously west to the Ohio, for it occupies the valley of that river at Kanawha in Virginia, and onwards to its mouth, and down the valley of the Mississippi probably to its mouth, and up its tributaries, west, into the Indian Territory. This brood has appeared the present year, 1855, and I have received specimens from Long Island, from South Illinois, and the Creek Indian country west of Arkansas," etc.

There is every reason to believe that Dr. Fitch, in this account, has confounded this *septemdecim* Brood VIII, with the great *tredecim* Brood XVIII, for it so happened that they both occurred simultaneously in 1855, but the exact dividing line of these two broods is not so easily ascertained. Certainly, after reaching the Ohio river, the *septemdecim* brood extends beyond Gallipolis, Ohio, for Prof. Potter, in his "Notes on the Cicada decem septima," records their appearance at that place in 1821; and Dr. Smith records their appearance at Frankfort, Lexington and Flemingsburg, Kentucky, in 1838, and 1855. But I strongly incline to believe that well nigh the rest of the territory mentioned by Dr. Fitch was occupied by the *tredecim* brood, the reasons for which belief will be found in the account of brood XVIII.

Cicadas also appeared in Buncombe and McDowell counties, North Carolina, in 1855, but until they appear there again it will be impossible to say, positively, whether they belong to this *septemdecim* Brood VIII, or to the *tredecim* Brood XVIII.

BROOD IX—*Septemdecim*—1857, 1874.

In the year 1874, and at intervals of 17 years thereafter, they will propably occur in southeast Nebraska.

The occurrence of this brood was communicated to me by Mr. Clarke Irvine, of Oregon, Holt county. The brood is most likely confined to the eastern or timbered portion of the State, and I judge it to be *septemdecim*, from the fact that the latitude is rather more northerly than tredecim is known to occur.

BROOD X—*Tredecim*—1862, 1875.

In the year 1875, and at intervals of 13 years thereafter, they will most likely occur in different parts of Texas. According to Dr. Smith they appeared in vast numbers in some parts of Texas in 1849, though he was not able to get any particulars.

BROOD XI—*Septemdecim*—1859, 1876.

In the year 1876, and at intervals of 17 years thereafter, they will in all probability appear in parts of North Carolina, Virginia, Maryland, Illinois and Indiana. According to Dr. Smith they appeared from Raleigh, North Carolina, to near Petersburg, Virginia, in 1842 and 1859; in Rowan, Davie, Cabarras and Iredell counties in the same State in 1825, 1842 and 1859; in the valley of Virginia as far as the Blue Ridge on the east, the Potomac river on the north, the Tennessee and North Carolina lines on the south, and for several counties west, in 1808, 1842 and 1859; in the south part of St. Mary's county, Maryland, dividing the county about midway east and west, in 1825, 1842 and 1859; in Illinois about Alton in 1842 and 1859; and in Sullivan and Knox counties, Indiana, in 1842 and 1859.

BROOD XII—*Septemdecim*—1860, 1877.

In the year 1877, and at intervals of 17 years thereafter, they will, in all probability, appear in the vicinity of Schuylerville and Fort Miller, in New York. From thence along both sides of the Hudson to its mouth, where they extend, at least, to New Haven, in Connecticut, and west across the north part of New Jersey and into Pennsylvania. Also in Dearborn county, Indiana; Kalamazoo, Michigan; in Pennsylvania, North Carolina, Virginia and Maryland.

This brood is recorded by Prof. Potter as having occurred at North Haven, Conn., in 1724, 1741, 1758, 1792, 1809 and 1826. It was also recorded by the same writer as having occurred in 1826 in Middlesex county, N. J., and by Dr. Fitch as having occurred in 1843 throughout the whole country mentioned above. In 1860, again, it was spoken of in the old series of the *Prairie Farmer* (Vol. 22, p. 119) as having occurred that year in New Jersey, and Dr. Smith records it throughout the whole State in 1775, 1792, 1809, 1826 and 1843. Mr. Jas. Angus, of West Farms, Westchester county, N. Y., has himself witnessed its recurrence in the years 1843 and 1860.

In Pennsylvania, Mr. Rathvon found a few individuals in 1860, and Dr. Smith says it extends from the Susquehanna to the Delaware river, bounded by Peter's mountain on the south. In Virginia it occurred from the south part of Loudon county to the Roanoke river, and from the Blue Ridge to the Potomac in 1826, 1843 and 1860. In Maryland from Ann Arundel county to the north part of St. Mary's, and from the Potomac to Chesapeake Bay, in 1809, 1826, 1843 and 1860. In Rockingham, Stokes, Guilford, Rowan, Surrey and adjacent counties, North Carolina, in 1792, 1809, 1826 and 1843. In Dearborn county, Indiana, in 1843 and in 1860, and in Kalamazoo, Michigan, during the same years.

BROOD XIII.—*Septendecim*—1861, 1878.

In the year 1878, and at intervals of 17 years thereafter, they will, in all probability, appear along the centre of the State of Illinois, all along the southern part of Iowa, and around St. Joseph, in Buchanan county, in North Missouri.

The records are abundant, of their appearance, in 1844 and 1861, all along the southern border of Iowa, and in Mason, Fulton, McDonough and Champaign counties in Central Illinois. In 1861 they also occurred in Champaign county, Central Ohio, and in Buchanan county, Northwest Missouri; and this brood not unlikely occupies, more or less, the whole strip of country between these two points. Their appearance in 1861 was associated with the first year of the rebellion; and Dr. Smith records this brood both in Illinois and Iowa in 1844.

BROOD XIV.—*Septendecim*—1862, 1879.

In the year 1879, and at intervals of 17 years thereafter, they will, in all probability, appear in the whole of western Missouri, commencing south about Johnson and Saline counties, and extending in a northwesterly direction to Lawrence and above, in Kansas, south to Arkansas, and west an unknown distance into Kansas; also, in Central Ohio.

The occurrence of this brood in 1845 and 1862 is well remembered by several of my correspondents, and is recorded by Dr. Smith. At St. Joseph, in Buchanan county, Mo., Cicadas were not so thick in 1862 as in 1861. Had it been the reverse, or, in other words, had they been more numerous in 1862 than in 1861, I should have been inclined to record the visit of 1861 as but a precursor to this Brood X; but as it is, I believe the two broods are distinct, and that they occur for two consecutive years, both in Central Ohio and in portions of Northwest Missouri.

This brood has not been traced further east, in Missouri, than Saline county, and yet a detachment of it certainly occurs in Ohio, for Mr. Clarke Irvine, of Oregon, Holt county, Mo., well remembers their occurrence in Central Ohio in 1845 and 1862. Though there is no knowledge of the appearance of this Brood XIV in Illinois, yet the fact of its occurring both in Ohio and in North Missouri, and that, too, but one year after Brood XIII, would indicate that there may have been, in times past, at all events, if there is not at the present day, a geographical connection between these two broods.

BROOD XV.—*Septendecim*—1863, 1880.

In the year 1880, and at intervals of 17 years thereafter, they will, in all probability, appear from western Pennsylvania to Sciota river, east, and down the valley of the Ohio river as far as Lewis county, in Virginia.

This brood is recorded in Ohio as far back as the year 1812, by "A. M. B.," writing to the Chicago *Tribune*, under date of June 22, 1868. Harris also records its appearance in Ohio in 1829, and they were quite numerous in Coles county, in the centre of the same State in 1846, or during the first year of the Mexican war, while Dr. Smith records it in the eastern part of the State, extending over twelve counties, west, to the Sciota river, and to Sandusky, on Lake Erie, in 1829, '46 and '63; and in Lewis county, Virginia, since 1795. As before stated this brood occurred in Ohio in 1846, simultaneously with the *tredecim* brood VII in South Illinois. Dr. Fitch, in his account of his 5th brood, also records its appearance, and states that it reached to Louisiana. But just as the *septemdecim* Brood VIII was confounded with the great *tredecim* Brood XVIII in 1855, so this *septemdecim* Brood XV was doubtless also confounded with it in 1829, for they both occurred that year. Had the western country been as thickly settled in 1829 as it was in 1855, the *tredecim* Brood XVIII could undoubtedly have been traced in Southern Illinois and Missouri, etc., in the former as it was in the latter year. This belief is furthermore greatly strengthened from our having no other record of the appearance of this *septemdecim* brood, in Louisiana, than Prof. Potter's statement that they appeared there in 1829, whereas they have occurred there since 1829 at intervals, not of 17, but of 13 years, and were there the present year, 1868, as will be seen on referring to Brood XVIII. The dividing line of these two broods (XV and XVIII) is probably the same as with broods VIII and XVIII.

BROOD XVI.—*Tredecim*—1867, 1880.

In the year 1880, being the same as the preceding, they will, in all probability, appear in the north part of Cherokee county, Georgia, having appeared there according to Dr. Smith in 1828, '41, '54, and according to Dr. Morris, in 1867. This brood occurred in 1867 simultaneously with the northern *septemdecim* brood XXI.

BROOD XVII.—*Septemdecim*—1864, 1881.

In 1881, and at intervals of 17 years thereafter, they will, in all probability, appear in Marquette and Green Lake counties, in Wisconsin, and may also appear in the western part of North Carolina, and about Wheeling, Virginia; in Northeast Ohio, and a few in Lancaster county, Pa., and Westchester county, New York.

There is abundant evidence that they appeared in the counties named in Wisconsin in 1864, and fair evidence that they appeared that year in Summit county, Northeast Ohio, while straggling specimens were found in the same year, by Mr. S. S. Rathvon, in Lancaster county, Pa., and by Mr. James Angus, in Westchester county, N. Y. Dr. Fitch also records their appearance in 1847, or 17 years previously, in the western part of North Carolina, and Dr. Smith, in Wheeling, Virginia, in 1830, '47 and '64. The distance between the localities given is very great, and it is doubtful whether all these records belong to one and the same brood.

BROOD XVIII.—*Tredeim*—1868, 1881.

In the year 1881, and at intervals of 13 years thereafter, they will, in all probability, appear in Southern Illinois, throughout Missouri, with the exception of the northwestern corner, in Louisiana, Arkansas, Indian Territory, Kentucky, Tennessee, Mississippi, Alabama, Georgia, and North and South Carolinas.

Though, as already stated, I published the first account ever given of the existence of a 13-year brood, yet, besides the others mentioned in this chronology, this particular brood has been traced since, as having occurred in the years 1816, '29, '42, '55 and '68; and Mr. L. W. Lyon, at the July (1868) meeting of the Alton, (Ills.) Horticultural Society, even mentioned its appearance in 1803.

In Missouri, it occurs more or less throughout the whole State with the exception of the northwest corner that is bounded on the east by Grand river, and on the south by the Missouri river.* The southeast part of the State, where Dr. Smith has recorded it since 1829, is most thickly occupied. I enumerate those counties in which there is undoubted evidence of their appearance during the present year (1868) viz.: Audrain, Bollinger, Benton, Clarke, Chariton, Callaway, Cooper, Cole, Franklin, Gasconade, Iron, Jefferson, Knox, Lewis, Marion, Macon, Morgan, Moniteau, Pike, Phelps, Pulaski, Polk, Pettis, Schuyler, St. Charles, St. Louis, St. Francois, St. Clair, Warren, and Washington.

It not improbably overlaps some of the territory occupied by the *septemdecim* Brood XIV, but I do not think it extends into Kansas.

In Illinois it occurs more or less throughout the whole southern half of the State, but more especially occupies the counties from the south part of Adams county along the Mississippi to the Ohio, up the Ohio and Wabash rivers to Edgar county, and then across the centre of the State, leaving some of the central counties in South Illinois unoccupied. To be more explicit, I enumerate all the counties in which it undoubtedly occurred during the present year (1868): Adams (south part, back of Quincy), Bond, Clinton (northwest corner, adjacent to Madison), Champaign, Coles, Crawford, Cumberland, Clay, Clark, Edwards, Edgar† (especially in the eastern part), Franklin, Gallatin, Hardin, Hamilton, Johnson, Jasper, Jersey, Jefferson, Lawrence, McLean (east end), Macon, Madison, Marion, Massac, Monroe,

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*As Mr. Wm. Raucher, of Oregon, Holt county, saw a few individuals in the northeast part of Buchanan county in 1855, it may occur in small numbers in districts even north of the Missouri river.

† Edgar county also has the *septemdecim* Brood III.

Pike, Perry, Piatt, Pope, Richland, Randolph, Sangamon, Saline, St. Clair, Union (northeast corner), Washington, Wayne, Wabash, Williamson and White. There were none the present year, either at Decatur, in Macon county, or at Pana in Christian county; nor were there any at Bloomington or Normal, in McLean; nor in Dewitt county, which lies south of McLean; nor in Spring Creek, Iroquois county, which is northeast of Champaign.

In Kentucky, according to Dr. Smith, it occurred in the northwest corner of the State, about Paducah and adjacent counties south, in 1829, '42, and '55, and it occurred there in 1868.

In Arkansas, it occupied all the northern counties in 1842, '55 and '68.

In Alabama, it occupied Russell and adjacent counties on the east side of Black Warrior river, in 1842, '55 and '68.

In Tennessee, it occupied Davidson, Montgomery, Bedford, Williamson, Rutherford and adjacent counties in 1842, '55* and '68.

In North Carolina, it appeared in Mecklenburg county, in 1829, '42, '55 and '68.

In South Carolina, the Chester district and all the adjoining country to the Georgia line, west, and to the North Carolina line, north, was occupied with it in 1816, '29, '42, '55 and '68.

In Georgia, it has occurred in Cherokee county since the year 1816.

In Louisiana, it appeared in Morehouse, Caddo, Clairborne, Washington and adjacent parishes, in 1855 and '68.

It also doubtless occurs in Mississippi and Indian Territory, though I am unable to specify any localities.

BROOD XIX.—*Septemdecim*—1865, 1882.

In the year 1882, and at intervals of 17 years thereafter, they will, in all probability, appear in Monroe, Livingston, Madison and adjacent counties, and around Cayuga Lake, in New York.

Mr. T. T. Southwick, of Manlius, Livingston county, records their appearance there in 1865, and, as will be seen by referring to the *Prairie Farmer*, vol. 16, p. 2, they appeared during the same year near Cayuga Lake, while Dr. Smith records their appearance in 1797, 1814, '31 and 48.

BROOD XX.—*Septemdecim*—1866, 1883.

In the year 1883, and at intervals of 17 years thereafter, they will, in all probability, appear in western New York, western Pennsylvania and eastern Ohio. In the last mentioned State they occur more especially in Mahoning, Carroll, Trumbull, Columbiana and adjacent counties, overlapping, especially in Columbiana county, some of the territory occupied by Brood XV. In Pennsylvania, they occupy nearly all the western counties, and their appearance is recorded in 1832, '49 and '66, by Dr. Fitch (his second brood), Dr. Smith, and several of my correspondents; the following counties being enumerated: Armstrong, Clarion, Jefferson, Chemung, Huntingdon, Cambria, Indiana, Butler, Mercer and Beaver.

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* Though they occurred in large numbers in Davidson county and other portions of Tennessee in 1855, and also the present year, yet in Lawrence county they appeared in 1856, instead of 1855—another instance of a belated brood.

BROOD XXI.—*Septemdecim*—1867, 1884.

In the year 1884, and at intervals of 17 years thereafter, they will, in all probability, appear in certain parts of North Carolina and Central Virginia. In 1850 and 1867 they appeared near Wilkesboro N. C., and were also in Central Virginia during the last mentioned year, while Dr. Smith mentions them as occurring in Monroe county, and the adjacent territory, in Virginia in 1833 and 1850.

Dr. Harris (Inj. Insects, p. 210) records their appearance at Martha's Vineyard, Massachusetts, in 1833, but as I cannot learn that they were there, either in 1850 or 1867, I infer that Dr. Harris's informant was mistaken.

BROOD XXII.—*Septendecim*—1868, 1885.

In the year 1885, and at intervals of 17 years thereafter, they will, in all probability, appear on Long Island; at Brooklyn, in Kings county, and at Rochester in Monroe county, New York; at Fall River, and in the southeastern portion of Massachusetts; at Oakland (Rutland?), Vermont; in Pennsylvania, Maryland, District of Columbia, Delaware and Virginia; in northwestern Ohio, in southeastern Michigan, in Indiana and Kentucky.

This brood has been well recorded in the East in 1715, 1732, 1749, 1766, 1783, 1800, 1817, 1834, 1851 and 1868. It is spoken of in "Hazzard's Register" for 1834, published in Philadelphia, while Mr. Rathvon has himself witnessed its occurrence during the four latter years in Lancaster county, Pa.

It is the fourth brood of Dr. Fitch, who only says that it "reaches from Pennsylvania and Maryland to South Carolina and Georgia, and what appears to be a detached branch of it occurs in the southeastern part of Massachusetts." He is evidently wrong as to its occurring in South Carolina and Georgia, and it is strange that he does not mention its appearance in New York, for Mr. F. W. Collins, of Rochester, in that State, has witnessed four returns of it there, namely: in 1817, '34, '51 and '68, while the Brooklyn papers record its appearance there the present season. As these two points in the State are about as far apart as they well can be, the intervening country is probably more or less occupied with this brood. Mr. H. Rutherford, of Oakland,* Vermont, records their appearance in that neighborhood in 1851 and 1868.

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*I can find no such post office as Oakland in Vermont, and incline to believe that the *Tribune* compositor made Oakland out of Rutland, and more especially as Rutland is on the New York border.

(N. Y. Semi-Weekly *Tribune*, June 27). He also witnessed them in the same place in 1855, and as will be seen by referring to Brood XVIII, they also occurred on Long Island and in southeastern Massachusetts in that same year, 1855. Exactly 13 years intervening between 1855 and 1868, one might be led to suppose that they had a *tredecim* brood in the East. But did such a brood exist, it would certainly have been discovered ere this, in such old settled parts of the country, and all the records go to show that they have nothing but *septemdecim* there. By referring to Brood VIII, the mystery is readily solved, for we find that in that part of the country there are two *septemdecim* broods—the one having last appeared in 1855—the other the present year, 1868.

In Ohio, this brood occurred more or less throughout the whole western portion of the State, for our correspondents record them as having appeared in 1868 in Lucas and Hamilton and several intervening counties. Mr. F. C. Hill, of Yellow Springs, in Green county, Southwest Ohio, has witnessed their appearance in 1834, 1851 and 1868, and they occurred in the northwestern part of the State during the three same years; while the correspondent to the Department of Agriculture, from Toledo, Northwest Ohio (July, 1868, Monthly Rep.), says it is their 9th recorded visit there. Dr. Smith records it as occurring around Cincinnati, in Franklin, Columbiana, Pike and Miami counties.

In Indiana, there is reliable evidence of their appearance, in 1868, in the southern part of the State, in Tippecanoe, Delaware, Vigo, Switzerland, Hendricks, Marion, Dearborn, Wayne, Floyd, Jefferson and Richmond counties. The evidence seems to show that, as in Ohio, throughout the State, they belong to this *septemdecim* Brood XXII, for Mr. F. Guy, of Sulphur Springs, Mo., has personally informed me that they were in Southern Indiana in 1851, and even in Tippecanoe county, on the Wabash river, where, from their proximity to Brood XVIII, one might have inferred them to be *tredecim*, they are recorded as appearing in 1834 and '51.

In Kentucky they appeared around Louisville. In Pennsylvania, Maryland, Delaware and Virginia, the territory occupied by this brood is thus described by Dr. Smith: "Beginning at Germantown, Pa., to the middle of Delaware; west through the east shore of Maryland to the upper part of Ann Arundel county; thence through the District of Columbia to London, West Virginia, where it ☞ laps over the South Virginia district (see Brood XII) from the Potomac to Loudon county, some 10 or 12 miles in width, and in this strip of territory Cicadas appear every 8th and 9th year. Thence the line extends through the north counties of Virginia and Maryland to the Savage mountains, and thence along the south tier of counties in Pennsylvania, to Germantown."

From the above synoptical view it results that there will, during the next 17 years, be broods of the Periodical Cicada somewhere or other in the United States in A. D. 1869, ’70, ’71, ’72, ’74, ’75, ’76, ’77, ’78, ’79, ’80, ’81, ’82, ’83, ’84 and ’85—or every year but 1873. It further appears that the number of distinct broods, appearing in distinct years, within the following geographical districts, are as follows: In southern New England 4 broods, years ’69, ’72, ’77 and ’85; in New York 5 broods, years ’72, ’77, ’82, ’83 and ’85; in New Jersey 2 broods, years ’72 and ’77; in Pennsylvania 7 broods, years ’70, ’71, ’72, ’77, ’80, ’83 and 85; in Ohio 7 broods, years ’72, ’78, ’79, ’80, 81, ’83 and ’85; in Indiana 4 broods, years ’71, ’76, ’77 and ’85; in Illinois 6 broods, years ’71, ’72*, ’76, ’77, ’78 and ’81*, and probably another in Jo Daviess county, year ’70; in Wisconsin 2 broods, years ’71 and ’82; in Michigan 2 broods, years ’71 and ’85; in Iowa 2 broods, years ’71 and ’78; in Nebraska 1 brood, year ’74; in Kansas 2 broods, years ’72* and ’79; in Missouri 4 broods, years ’72*, 78, ’79 and ’81*; in Louisiana and Mississippi 3 broods, years ’71*, ’72* and 81*; in Tennessee 2 broods, years ’72* and ’81*; in Arkansas, Indian Territory and Alabama, 1 brood, year ’81*; in Kentucky 3 broods, years ’72, ’81* and 85; in Georgia 4 broods, years ’69*, ’72*, ’80* and ’81*; in South Carolina 1 brood, year ’81*; in North Carolina 6 broods, years ’72?, ’76, ’77, ’81?, ’81* and ’84; in East and West Virginia 5 broods, years ’72, ’77, ’80, ’81 and 84; in Maryland 4 broods, years ’72, ’76, 77 and 85; in District of Columbia 1 brood, year ’85; in Delaware 2 broods, years ’72 and 85; in Florida 1 brood, year 73*; in Texas 1 brood, year 75*.

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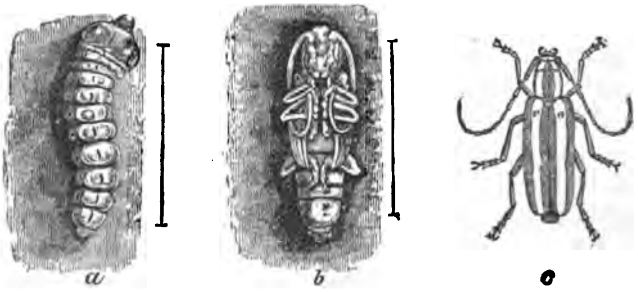
* The broods marked (*) belong to the 13-year or tredecim race of the Periodical Cicada.

APPLE-TREE BORERS.

(Coleoptera, Cerambicidæ.)

THE ROUND-HEADED APPLE-TREE BORER—*Saperda bivittata*, Say.

[Fig. 14.]



It is a fact which has not been disputed by any one whom I have queried on the subject, that apple trees on our ridges are shorter lived than those grown on our lower lands. Hitherto no particular reason has been given for this occurrence, but I think it is mainly attributable to the workings of the borer now under consideration. I have invariably found it more plentiful in trees growing on high land than in those growing on low land, and it has also been my experience that it is worse in ploughed orchards than in those which are seeded down to grass. Fifty years ago, large, thrifty, long-lived trees were exceedingly common, and were obtained with comparatively little effort on the part of our ancestors. They had not the vast army of insect enemies to contend with, which at the present day make successful fruit-growing a scientific pursuit. This Apple-tree borer was entirely unknown until Thomas Say described it in the year 1824; and, according to Dr. Fitch, it was not till the year following that its destructive character became known in the vicinity of Albany, N. Y., for the first time. Yet it is a native American insect, and has for ages inhabited our indigenous crabs, from which trees my friend, Mr. A. Bolter, took numerous specimens, in the vicinity of Chicago, ten years ago. It also attacks the quince, mountain ash, hawthorn, pear and the June-berry. Few persons are aware to what an alarming extent this insect is infesting the orchards in St. Louis, Jefferson and adjacent counties, and, for aught I know, throughout the State. A tree becomes unhealthy and eventually dwindles and dies, often without the owner having the least suspicion of the true cause—the gnawing worm within. Even in the orchard of the most worthy president of our State Horticultural Society, I found one or more large worms at the base of almost every tree that I examined, notwithstanding he had been of the opinion that there was not a borer of this kind on his place.

At Figure 14, this borer is represented in its three stages of larva (*a*), pupa (*b*), and perfect beetle (*c*). The beetle may be known by the popular name of the Two-striped Saperda, while its larva is best known by the name of the Round-headed apple-tree borer, in contradistinction to the Flat-headed species, which will be presently treated of.

The average length of the larva, when full-grown, is about one inch, and the width of the first segment is not quite ¼ of an inch. Its color is light yellow, with a tawny yellow spot of a more horny consistency on the first segment, which, under a lens, is found to be formed of a mass of light brown spots. The head is chestnut-brown, polished and horny, and the jaws are deep black. The pupa is of rather lighter color than the larva, and has transverse rows of minute teeth on the back, and a few at the extremity of the body; and the perfect beetle has two longitudinal white stripes between three of a light cinnamon-brown color. The Two-striped Saperda makes its appearance in the beetle state during the months of May and June, and is seldom seen by any but the entomologist who makes a point of hunting for it—from the fact that it remains quietly hidden by day and flies and moves only by night. The female deposits her eggs during the month of June, mostly at the foot of the tree, and the young worms hatch and commence boring into the bark within a fortnight afterwards. These young worms differ in no essential from the full grown specimens, except in their very minute size; and they invariably live, for the first year of their lives, on the sap-wood and inner bark, excavating shallow, flat cavities which are found stuffed full of their sawdust-like castings. The hole by which the newly hatched worm penetrated is so very minute that it frequently fills up, though not till a few grains of castings have fallen from it; but the presence of the worms may be generally detected, especially in young trees, from the bark, under which they lie, becoming darkened, and sufficiently dry and dead to contract and form cracks. Through these cracks, some of the castings of the worm generally protrude, and fall to the ground in a little heap, and this occurs more especially in the spring of the year, when, with the rising sap and frequent rains, such castings become swollen and augment in bulk. Some authors have supposed that the worm makes these holes to push out its own excrement, and that it is forced to do this to make room for itself; but, though it may sometimes gnaw a hole for this purpose, such an instance has never come to my knowledge, and that it is necessary to the life of the worm is simply a delusion, for there are hundreds of boring insects which never have recourse to such a procedure, and this one is frequently found below the ground, where it cannot possibly thus get rid of its castings. It is currently supposed that this borer penetrates into the heart wood of the tree after the first year of its existence, whereas the Flat-headed species is supposed to remain for the most part immediately under the bark; but I find that on these points no rules can be given, for the Flat-headed species also frequently penetrates into the solid heart wood, while the species under consideration is frequently found in a full grown state just under the inner bark, or in the sap-wood. The usual course of its life, however, runs as follows:

As winter approaches, the young borer descends as near the ground as its burrow will allow, and doubtless remain inactive till the following spring. On approach of the second winter it is about one-half grown and still living on the sap-wood; and it is at this time that these borers do the most damage, for where there are 4 or 5 in a single tree, they almost completely girdle it. In the course of the next summer when it has become about three-fourths grown, it generally commences to cut a cylindrical passage upward into the solid wood, and before having finished its larval growth, it invariably extends this passage right to the bark, sometimes cutting entirely through a tree to the opposite side from which it commenced; sometime turning back at different angles. It then stuffs the upper end of the passage with sawdust-like powder, and the lower part with curly fibres of wood, after which it rests from its labors. It thus finishes its gnawing work during the commencement of the 3d winter, but remains motionless in the larval state till the following spring when it casts off its skin once more and becomes a pupa. After resting three weeks in the pupa state it becomes a beetle, with all it members and parts at first soft and weak. These gradually harden and in a fortnight more it cuts its way through its sawdust-like castings, and issues from the tree through a perfectly smooth and round hole. Thus it is in the tree a few days less than three years, and not merely two years as Dr. Fitch suggests. I have come to this conclusion from having frequently found, during the past summer, worms of three distinct sizes in the same orchard, and Mr. D. B. Wier of Lacon, Ills., had previously published the fact*, while a correspondent to the *Country Gentleman* of Albany, N. Y.† who says he has large experience with this borer, sent to the editors specimens of all three sizes, which he calls "this years, two and three year old worms." The individual from which I drew my figures, and which was taken from a crab apple tree, went into the pupa state on the 14th day of March and became a beetle on the 15th of April; but was doubtless forced into rapid development by being kept throughout the winter in a warm room.

Remedies.—From this brief sketch of our Round-headed borer, it becomes apparent that plugging the hole to keep him in, is on a par with locking the stable door to keep the horse in, after he is stolen; even supposing there were any philosophy in the plugging system, which there is not. The round smooth holes are an infalliable indication that the borer has left, while the plugging up of any other holes or cracks where the castings are seen, will not affect the intruder. This insect probably has some natural enemies belonging to its own great class, and some of our wood-peckers doubtless seek it out from its retreat and devour it; but its enemies are certainly not sufficiently under our control, and to grow healthy apple trees, we have to fight it artificially. Here again prevention will be found better than cure, and a stitch in time will not only save nine, but fully ninety-nine.

Experiments have amply proved that alkaline washes are repulsive to this insect, and the female beetle will not lay her eggs on trees protected by such washes. Keep the base of every tree in the orchard free from weeds and trash, and apply soap to them during the month of May, and they will not likely be troubled with borers. For this purpose soft soap or common bar soap can be used. The last is perhaps the most convenient and the newer and softer it is, the better. This borer confines himself almost entirely to the butt of the tree, though very rarely it is found in the crotch. It is therefore only necessary in soaping, to rub over the lower part of the trunk and the crotch, but it is a very good plan to lay a chunk of the soap in the principal crotch, so that it may be washed down by the rains. In case these precautions have been unheeded, and the borer is already at work, many of them may be killed by cutting through the bark at the upper end of their burrows, and gradually pouring hot water into the cuts so that it will soak through the castings and penetrate to the insect. But even where the soap preventive is used in the month of May, it is always advisable to examine the trees in the fall, at which time the young worms that hatched through the summer may be generally detected and easily cut out without injury to the tree. Particular attention should also be paid to any tree that has been injured or sun-scalded, as such trees are most liable to be attacked. Mr. Wier who has had considerable experience with this insect, thus describes his method of doing this work, in the article already alluded to:

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* *Prairie Farmer*, Chicago, April 20, 1867.

† *Country Gentleman*, Sept. 12, 1867.

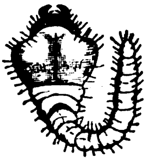
"I will suppose that I have a young orchard of any number of trees, say a thousand, the second season after planting, about the last of July, or during the first half of August, with a common hoe, I take all the weeds and other trash, and about an inch of soil, from the crown of the trees; then, any time from the first to the middle of September, with a pocket-knife, examine carefully the stem of each tree; the borer can readily be found by the refuse thrown out of the hole made on entering; this refuse of a borer, of the same season's growth, will be about the size of a pea, and, being of a glutinous nature, sticks around the mouth of the hole, and can rapidly be seen; older ones throw out coarser chips that fall to the ground. [As already shown these chips are not thrown out by the borer, but are forced out by swelling.] When one is found, take the knife and cut him out. If an orchard is carefully examined in this way each year, there need be but few, if any borers missed, and as they are more easily found the second fall of their growth, and can have done but little damage at that time, we would never receive any serious injury from them. Now, it is no great task to do this; a man will clear the litter and soil from around a thousand trees, in a day, and can take the borers out in another day. I will agree to do both jobs carefully in one day's time. A great undertaking is it not?"

He also has observed that some varieties of the apple-tree have a greater immunity from the attacks of this borer, than have others; on account of the young larva, when it is first hatched, being drowned out by the sap, but he does not mention any particular varieties other than those that are the "more vigorous and late growing."

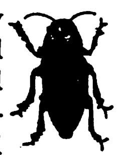
THE FLAT-HEADED APPLE-TREE BORER—*Chrysobothris femorata*, Fabr.

(Coleoptera, Buprestidæ.)

[Fig. 15.]



[Fig. 16.]



This borer which is represented in the larva state at Figure 15, may at once be recognized by its anterior end being enormously enlarged and flattened. It is paler than the preceding, and makes an entirely different burrow. In consequence of its immensely broad and flattened head, it bores a hole of an oval shape and twice as wide as high. It never acquires much more than half the size of the other species, and is almost always found with its tail curled completely round towards the head. It lives but one year in the tree and produces the beetle, represented at Figure 16, which is of a greenish black color with brassy lines and spots above, the underside appearing like burnished copper. This beetle flies by day instead of by night, and may often be found on different trees basking in the sunshine. It attacks not only the apple, but the soft maple, oak, peach, and is said to attack a variety of other forest trees; though, since the larvæ of the family (BUPRESTIDÆ) to which it belongs all bear a striking resemblance to each other, it is possible that this particular species has been accused of more than it deserves.

It is, however, but far too common in the Valley of the Mississippi, and along the Iron Mountain and Pacific railroads, it is even more common than the preceding species. Mr. G. Pauls, of Eureka. informs me that it has killed fifty apple trees for him, and Mr. Votaw, and many others in that neighborhood have suffered from it in like manner. It is also seriously affecting our soft maples by riddling them through and through, though it confines itself far the most part to the inner bark, causing peculiar black scars and holes in the trunk. Unless its destructive work is soon checked, it bids fair to impair the value of this tree for shade and ornamental parposes, as effectually as the Locust borers have done with the locust trees.

REMEDIES.—Dr. Fitch found that this borer was attacked by the larvæ of some parasitic fly, belonging probably to the *Chalcis* family, but it is greatly to be feared that this parasite is as yet unknown in the west. At all events this flat-headed fellow is far more common with us than with our eastern brethren. As this beetle makes its appearance during the months of May and June, and as the eggs are deposited on the trunk of the tree, as with the preceding species, the same method of cutting them out or scalding them can be applied in the one case as in the other; while the soap preventive is found to be equally effectual with this species as with the other. It must, however, be applied more generally over the tree, as they attack all parts of the trunk, and even the larger limbs.

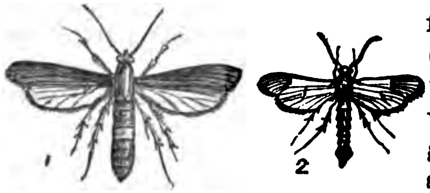
THE PEACH BORER—*Ægeria exitiosa*, Say.

(Lepidoptera, Ægeridæ.)

This pernicious borer I find to be quite common throughout the State. It is withal an insect so familiar to the peach-grower, and its history has been so often given in current entomological works that I should let it go unnoticed, were it not for the numerous letters of inquiry about it that have been sent to me during the year. For a complete and lengthened history of it, I refer the reader to the first of Dr. Fitch's most excellent reports.

From the Round-headed Apple-tree borer, to which it bears some resemblance both in its mode of work and general appearance, it is at once distinguished by having six scaly and ten fleshy legs. It works also more generally under the surface of the ground, and goes through its transformations within a year, though worms of two or three sizes may be found at almost any season. When full grown the worm spins for itself a follicle of silk, mixed with gum and excrement, and in due time issues as a moth. As it is not so well known in this last state, I annex (Fig. 17) figures of both male (2) and female (1) moths. As will be seen from these figures, the two sexes differ very materially from each other, the general color in both being glossy steel-blue. Some specimens which were received from Mr. W. S. Jewett, of Pevely, Jefferson county, commenced issuing as moths on the 20th of July, but I found empty follicles the latter part of May in trees which had been thoroughly wormed the year before, and from which the moths has consequently left at that early date. This borer likewise attacks the plum-tree, though singularly enough it causes no exudation of gum in this as it does in the peach tree.

[Fig. 17.]



REMEDIES.—I have had ample occasion to witness the effects of the mounding system during the summer, in several different orchards, and am fully convinced that it is the best practical method of preventing the attacks of this insect, and that it matters little whether ashes or simple earth be used for the mound. True, there are parties who claim (and among them Dr. Hull, of Alton, Ills.,) that the almost complete exemption from borers in mounded peach-orchards is due, not to any special effect produced by the mound, but to the general rarity of the insect. But I have found no general rarity of the insect, wherever I have been in our own State; but on the contrary, have with difficulty found a single tree in any orchard that was in anywise neglected, that did not contain borers; while I have found mounded trees entirely exempt. The following paragraph communicated to the *Western Rural* by Mr. B. Pullen, of Centralia, Illinois, touches on this point, and I can bear witness to the thrift and vigor of Mr. P.'s trees:

"As spring will soon be upon us I wish to add my testimony in favor of the "banking system," as a preventive against the attacks of the peach-borer. As to its efficacy there can be no doubt. I have practiced it four years with complete success. I would not advise its adoption until after the trees are four years old. During most of this period the bark is tender, and trees are liable to be entirely girdled by even a single worm. Safety lies only in personal examination and removal with the knife, in fall and spring (September and April). In April of the fourth year bank up to the hight of from ten to twelve inches, pressing the dirt firmly around the tree. A little dirt should be added each successive spring. It is not only a preventive but a great saving of labor."

As further testimony, and with a view to giving the method by which the trees may be mounded, I also insert the following communication from E. A. Thompson, of Hillside (near Cincinnati), Ohio, which appeared in the *Journal of Agriculture*, of Nov. 14, 1868:

"The mounding system was first practiced, so far as I know, by Isaac Bolmar, of Warren county, Ohio. I visited his orchards some years ago—acquainted myself with his system—and concluded to try it upon my orchard of 4,000 trees—then one year planted. I plant my trees in the fall, and in the spring following cut them back to six inches above the bud. The tree then instead of having one body has several—from three to six. The second summer I plow both ways, turning the furrows toward the trees. The men follow with shovels, throwing the loose soil around the tree to the heighth of about one foot. In the fall I cut the trees back, taking off about one-third of the year's growth. The next spring or summer I pursue the same method, raising the mound about one foot higher; cut back in the fall, and the third summer repeat the process, raising the mound another foot, which finishes the job. The mound will then be about three feet high at its apex and six feet in diameter at its base. The mounding need not be done in the summer, or at any particular season; it is just as well done in the fall when the hurry is over. The dirt is never taken away from the trees—in fact it cannot be removed without injury to the tree—for the young rootlets each year keep climbing up through this mound. I had occasion to remove one of these mounds a few days since and found it a mass of healthy roots.

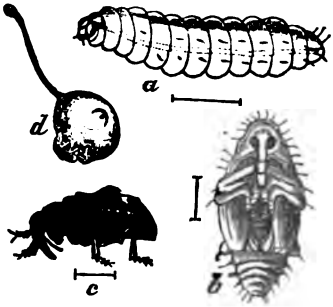
"Now for the benefits. First you have no trouble with grub or borer; he must have light and air, and the mound is too much for him; he comes out and that is the last of him. I have never wormed my trees, or hunted for the borer, and an orchard of healthier or thriftier trees cannot be found. It has been asserted that the borer will re-appear again near the top of the mound—but I am satisfied this is not the case; I have never thus far been able to find one. Second, the system imparts longevity to the tree. I saw a tree in Warren county treated in this manner *thirty* (30) years old, still healthy and bearing annual crops. Third, trees thus treated are not subject to disease. I have never had a case of *yellows* in my orchard. Fourth, the expense is trifling—one man can mound fifty trees per day. The system can be applied to old as well as young orchards; but if old trees are thus treated they should be first severely cut back, when they will make a growth of young wood."

The application of soap does not appear to prevent the moth from depositing her eggs, as in the case of apple tree borers. Hot water is very efficient in killing the young borers, after the earth has been removed, and it should be applied copiously, and *hot* nigh unto the boiling point, for there is no danger of its injuring the tree. Those who grow tobacco will also find it profitable to throw the stems around the butts of their trees, as there is good evidence of its being obnoxious to the moth.

THE PLUM CURCULIO—*Conotrachelus nenuphar*, Herbst.

(Coleoptera, Curculionidæ).

[Fig. 18.]



I regret to have to state that Missouri is none the less exempt from the ruinous work of this persistent "Little Turk," than are her sister States, though I have not heard of a single instance where they have been so numerous as they were last summer in Southern Illinois; for Parker Earle, of South Pass, captured 6,500 from 100 peach trees, during the first six days of May. In every locality which I have visited, this beetle is considered *the* enemy to stone fruit, and though so much has been written about it, I find it necessary to devote a few pages to its consideration, since some of the points in its natural history are not entirely and satisfactorily settled, even yet. There is in fact conflicting evidence from different authors, as to whether it is single or double brooded each year, and as to whether it hybernates principally in the perfect beetle state, above ground, or in the preparatory states, below ground; the very earliest accounts that we have of the Plum Curculio, in this country, differing on these points. Thus, it was believed by Dr. James Tilton, of Wilmington, Deleware, who wrote at the very beginning of the present century, and by Dr. Joel Burnett, of Southborough, and M. H. Simpson, of Saxonville, Massachusetts, who both wrote interesting articles on the subject, about fifty years afterwards; that it passed the winter in the larval or grub state, under ground, and Harris seems to have held the same opinion. But Dr. E. Sanborn, of Andover, Massachusetts, in some interesting articles published in 1849 and 1850, gave as his conviction that it hybernates in the beetle state above ground. Dr. Fitch, of New York, came to the conclusion that it is two-brooded, the second brood wintering in the larva state in the twigs of pear trees; while Dr. Trimble, of New Jersey, who devoted the greater part of a large and expensive work to its consideration, decided that it is single-brooded, and that it hybernates in the beetle form above ground. Since the writings of Harris and Fitch, and since the publication of Dr. Trimble's work there have been other papers published on the subject. The first of these was a tolerably exhaustive article, by Mr. Walsh, which appeared in the *Practical Entomologist* (Vol. II, No. 7), in which he takes the grounds that the Curculio is single-brooded; though subsequently he came to the very different conclusion that it was double-brooded, (First Annual Rep., p. 67). In the summer of 1867 I spent between two and three weeks in Southern Illinois, during the height of the Curculio season, and closely watched its manœuverings. From the fact that there was a short period about the middle of July, when scarcely any could be caught from the trees, and that after a warm shower they were quite numerous, having evidently just come out of the ground,* I concluded that it was double-brooded and communicated to the *Prairie Farmer* of July 27th, 1867, the passage to that effect, under the signature of "V," which is quoted by Mr. Walsh (Rep., p. 67), as corroborative of its two-brooded character. Subsequent calculation induced me to change my mind, and I afterwards gave it as my opinion that there was but one main brood during the year, and that where a second generation was produced it was the exception, (Trans. Ills. State Hort. Soc., 1867, p. 113). Finally Dr. E. S. Hull, of Alton, Illinois, who has had vast personal experience with this insect, read a most valuable essay on the subject, before the meeting of the Alton (Ills.), Horticultural Society of March, 1868, in which he evidently concludes they are single-brooded, and that they pass the winter, for the most part, in the preparatory states, underground.

Now, why is it that persons who, it must be admitted, were all capable of correct observation, have differed so much on these most interesting points in the economy of our Plum Curculio? Is there any explanation of these contradictory statements? I think there is, and that the great difficulty in the study of this as well as of many other insects, lies in the fact that we are all too apt to generalize. We are too apt to draw distinct lines, and to create rules which never existed in nature—to suppose that if a few insects which we chance to watch are not single-brooded, therefore the species must of necessity be double-brooded. We forget that Curculios are not all hatched in one day, and from analogy, are very apt to underrate the duration of the life of the Curculio in the perfect beetle state. Besides, what was the exception one year may become the rule the year following. In breeding butterflies and moths, individuals hatched from one and the same batch of eggs on the same day, will frequently, some of them, perfect themselves and issue in the fall, while others will pass the winter in the imperfect state, and not issue till spring; and in the case of a green worm that is found on raspberry leaves, and which passes the winter under-ground, and develops into a four-winged fly (*Selandria rubi* of my manuscript) in the spring; I have known a difference of three months to occur between the issuing of the first and last individuals of the same brood, all the larvæ of which had entered the ground within three days. It is also a well recorded fact, both in this country and in Europe, that in 1868, owing, probably, to the unusual heat and drouth of the summer, very many insects which are well known to usually pass the winter in the imperfect state, perfected themselves in the fall, and in some instances produced a second brood of larvæ. Far be it from me to pronounce that there is no such thing as rule in nature, and that we cannot, therefore, generalize; I simply assert that we frequently draw our lines too rigidly, and endeavor to make the facts come within them, instead of loosening and allowing them to encompass the facts. It was thus that the Joint-worm fly was for so long a time suspected to be a parasite instead of the true culprit, because all the other species in the genus (*Eurytoma ?*), to which it was supposed to belong, were known to be parasitic. For those who are not acquainted with the appearance of the Plum Curculio, in its different stages, I have prepared, at Figure 18, correct and magnified portraits of the full-grown *larva* (*a*); of the *pupa* (*b*) into which the larva is transformed within a little cavity underground, and of the perfect curculio (*c*).

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*I have often noticed, and the fact has been remarked by others, that insects which have been comparatively inactive for many days, in dry weather, fly freely after a warm shower, and it is possible that the increase of the Curculio after such rains is partly due to their flying in more vigorously from the surrounding woods.

With this prelude I will now give what I believe to be facts in its natural history, founded on my own observations of the past year, and on the observations of others. I firmly believe:

1—That Plum Curculios are a most unmitigated nuisance, and, though most beautiful objects under the microscope, the fruit-growers of the United States, if they had their own way about the matter, would wish them swept from off the face of the Earth, at the risk even of interfering with the "Harmony of Nature."

2—That they are more numerous in timbered regions than on the prairie.

3—That they *can* fly and *do* fly during the heat of the day, and that cotton bandages around the trunk, and all like contrivances to prevent their ascending the trees, are worse than useless, and a result only of ignorance of their economy.

4—That by its punctures it causes the dreaded peach-rot to spread, whenever that disease is prevalent, though it cannot possibly be the first cause of the disease. The peach-rot is now pretty generally acknowledged to be a contagious disease of a fungoid nature, and I believe that the spores of this fungus, "a million of which might be put upon the point of a stick whittled down to nothing," attach themselves more readily to fruit which has the skin abraded, and from which the gum issues, than to whole or unpunctured fruit. With this belief I made some effort to procure, for the benefit of my readers, a synopsis of the growth of this fungus; but, alas! I find that nothing but confusion exists with regard to it. Upon applying to my friend, Dr. T. C. Hilgard, of St. Louis—a recognized authority on such subjects—he furnished me with the article which may be found in the *Journal of Agriculture* of January 16th, 1869. I most respectfully declined publishing it in these pages, knowing that the reader would not be likely to understand what was either too *profound* or too befogged for my own comprehension, and those who require a *synopsis* of this fungus, are referred to that article. Verily, we must conclude that Peach-rot is not yet much understood, if a more clear exposition of it cannot be given!

5—That they prefer smooth-skinned to rough skinned fruit.

6—That up to the present time the Miner and other varieties of the Chickasaw plum have been almost entirely exempt from their attacks, and that in the Columbia plum the young larvæ are usually "drowned out" before maturing.

7—That they deposit and mature alike in nectarines, plums, apricots, cherries and peaches; in black knot on plum trees, and in some kinds of apples, pears and quinces; and, according to Dr. Hull, they also deposit but do not mature in strawberries, gooseberries, grapes, and in the vigorous shoots of the peach tree.

8—That it is their normal habit to transform underground, though some few undergo their transformations in the fruit.

9—That the cherry, when infested, remains on the tree, with the exception of the English Morello, which matures and then separates from the stem; but that all other fruits, when containing larvæ, usually fall to the ground. In the larger fruits four or five larvæ may sometimes be found in a single specimen, and I have taken five full grown larvæ from a peach that had evidently fallen and laid on the ground for over a week.

10—That the greater portion of them pass the winter in the perfect beetle state, under the old bark of both forest and fruit trees, under shingles, logs, and in rubbish of all kinds, and especially in the underbrush of the woods.

11—That they are always most numerous in the early part of the season on the outside of those orchards that are surrounded with timber, and that they frequently shelter in apple-trees and other trees before the stone fruit forms.

12—That a certain portion of them also pass the winter underground, both in the larva and pupa states, at a depth, frequently of from 2 to 3 feet.

13—That those which hybernate as beetles, begin to leave their winter quarters and to enter our orchards, throughout central Missouri, during the first days of May, and commence to puncture the fruit about the middle of the same month—a little earlier or later according to the season—the fruit of the peach being at the time about the size of a small marble.

14—That those which hybernate underground continue to develop and to issue from the earth during the whole month of May.

15—That both males and females puncture the fruit for food, by gouging hemispherical holes, but that the female alone makes the well-known crescent-shaped mark (see Fig. 18, *d.*), as a nidus for her egg.

16—That the egg is deposited in the following manner, the whole process requiring about five minutes: Having taken a strong hold on the fruit (see Fig. 18, *d*), the female makes a minute cut with the jaws, which are at the end of her snout, just through the skin of the fruit, and then runs the snout under the skin to the depth of 1-16th of an inch, and moves it back and forth until the cavity is large enough to receive the egg it is to retain. She next changes her position, and drops an egg into the mouth of the cut; then, veering round again, she pushes it by means of her snout to the end of the passage, and afterwards cuts the crescent in front of the hole so as to undermine the egg and leave it in a sort of flap; her object apparently being to deaden this flap so as to prevent the growing fruit from crushing the egg, though Dr. Hull informs me that he has repeatedly removed the insect as soon as the egg was deposited and before the flap was made, and the egg hatched and the young penetrated the fruit in every instance.

17—That the egg is oval, of a pearl-white color, large enough to be seen with the naked eye, requires a temperature of at least 70° Fahr. to hatch it, and may be crushed with the finger-nail without injuring the fruit.

18—That the stock of eggs of the female consists of from 50 to 100; that she deposits from 5 to 10 a day, her activity varying with the temperature.

19—That the last of those curculios which hybernated in the imperfect state under-ground have not finished depositing till the end of June and beginning of July, or about the time that the new brood developed from the first laid eggs of the season, are beginning to issue from the ground; and that we thus have them in the month of June in every conceivable state of existence, from the egg to the perfect insect.

20—That the period of egg depositing thus extends over more than two months.

21—That all eggs deposited before the first of July generally develop and produce Curculios the same season, which issue from the ground during July, August and September and hybernate in the perfect state.

22—That most of those which hatch after the first of July, either fail to hatch, or the young larvæ die soon after hatching, owing perhaps to the more ripe and juicy state of the fruit, being less congenial to them; and that what few do mature, which hatch after this date, undergo their transformations more slowly than the rest and pass the winter in the ground.

23—That the perfect Curculio while in the ground is soft and of a uniform red color, and that it remains in this state an indefinite period, dependent on the weather, usually preferring to issue after a warm rain.

24—That in a stiff clay soil a severe drought will kill many of them while in this last named condition, and that larvæ contained in stone fruits that fall upon naked ploughed ground where the sun can strike them, generally die.

This catalogue might be lengthened, but already embraces all the more important facts, and I think they sufficiently prove that the Curculio is single-brooded. There is, it is true, no particular reason why the earliest developed Curculios, or those which issue from the ground during the fore part of July, should not pair and deposit eggs again; other than it does not appear to be their nature to do so. Such an occurrence is by no means an isolated one in insect life, and aside from the fact that late fruit is almost entirely exempt from them, we have the experiments of Dr. Trimble which indicate that they have to pass through the winter before being able to reproduce their kind. The only other experiments that were ever made to prove the contrary hypothesis, are those detailed by Mr. Walsh, in his First Annual Report (p. 68), and, as may be seen from their perusal they prove nothing at all. To give them in his own words, I here quote them in full:

"EXPERIMENT 1ST.—On June 24th, I placed in a large glass vase, with moist sand at the bottom of it, a quantity of wild plums, every one of which I had previously ascertained to bear the crescent symbol of the 'little Turk.' During the three following weeks I added from day to day a number of plums, all of them bearing the same symbol, that had fallen from a tame plum-tree in my garden. The whole number of plums, as I subsequently ascertained, was 183, and the tame fruit probably formed about a fourth part of the whole. The first Curculio came out July 19th, and with the exception of July 21st and August 1st, there were more or less came out every day till August 4th, inclusive; after which day no more came out. The numbers coming out on each successive day were as follows, the very large number on July 25th having been probably caused by my wetting the sand on that morning rather copiously: 1, 18, 0, 3, 4, 2, 55, 8, 4, 3, 1, 2, 1, 0, 5, 4, 2. Total, 113. On examining the contents of the vase, November 29th, I found five dead and dried up Curculios among the plums, and among the sand sixteen dead and immature specimens, which had obviously failed to make their way up to the light of day, besides the remains of a good many individuals which had perished in the sand in the larva or pupa state, and were not counted. The Grand Total from 183 infested plums was, therefore, 134 Curculios in the beetle state, and an unknown number of larvæ and pupæ."

"EXPERIMENT 2d.—On July 27th, or eight days before the Curculios in the preceding experiment had ceased coming out, I placed in a vase, similar to the above, 243 plums, gathered promiscuously off some badly-infested wild plum-trees. From this lot no Curculios whatever came out till August 23d, and from that day, until September 14th, more or less came out daily, with the exception of five out of the 23 days, the numbers on the respective days being as follows: 3, 1, 2, 2, 2, 3, 2, 2, 5, 3, 1, 0, 5, 6, 3, 2, 0, 0, 0, 1, 0, 1, 1. Subsequently, on September 18th, there came out 3, on September 24th, 1, and on September 28th, 1; after which no more made their appearance. Total, 50 Curculios from 243 plums, some stung and some not. On examining the contents of this vase on November 29th, I found a single dead Curculio among the plums, making a Grand Total of 51 Curculios bred from these plums. There were no specimens, either in

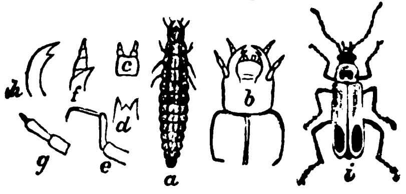
larva, pupa or beetle state, to be found among the sand in the vase on November 29th; which was, perhaps, due to the contents having kept much moister than those of the first vase, though on July 25th I had, as I thought, moistened the sand in the first vase quite sufficiently."

Now because there was an intermission of 19 days when no Curculios came out, Mr. Walsh arrives at once to the conclusion that there are two distinct broods, the second of which is, "of course" generated by the first. If the infected plums had been collected and placed in vases day by day, or if the curculios bred in the first experiment had been furnished with fresh plums and had actually paired and deposited again, the experiments would have been satisfactory; but as they stand, they seem to me, on the very face, to forbid the conclusions to which the experimenter arrived. In both these experiments the very result was obtained that might have been expected, for I have myself proved, that with favorable conditions the Curculio remains under ground about 3 weeks, and as there would naturally be none advanced beyond the full grown larva state, when first put into the vase, perfect Curculios could not possibly appear till they had had time to transform, or in other words, till about three weeks after the plums were placed in the vase. Thus from the plums placed in the vase on the 24th of June the first Curculios appeared on the 19th of July—25 days afterwards; while from those placed in the second vase on July 27th, the first Curculios appeared on the 23d of August—27 days afterwards. The interval also, of 19 days which elapsed between the issuing of the last Curculios in the first experiment and the first curculios in the last experiment, was exactly what should have been expected, since the plums were placed in the second vase eight days before the last curculios in the first vase had issued. Had the plums been placed in the second vase 10 days earlier or 10 days later, there would have been an intermission of 9 or 29 days accordingly, in their coming out, etc., etc. Moreover, a period of at least 50 days elapses between the deposition of an egg and the time required for that egg to develop into a Curculio and even on the supposition that the female commenced depositing the moment she left the ground, which is certainly not the case, the Curculios bred in the second vase could not possibly have been the progeny of any that appeared contemporaneously with those bred from the first vase.

NATURAL REMEDIES.—There is no very good evidence that any true parasites infest the Curculio, and though it was well known that ants attacked and killed the larvæ as they left the fruit to enter the ground, yet until the present year no other cannibals were known to attack it; but Mr. Walsh in his interesting account of a trip through Southern Illinois has shown that there are several cannibal insects which habitually prey upon it. From this account which was published in the AMERICAN ENTOMOLOGIST—pp. 33–35—I condense the following facts.

THE PENNSYLVANIA SOLDIER-BEETLE (*Chauliognathus pennsylvanicus*, DeGeer).—This beetle which is represented at Figure 19, *i* is of a yellow color, marked with black. It is a common species and I have found it quite abundant in our own State on the flowers of the Goldenrod during the months of September and October. Its larva (Fig. 7, *a*) is one of the most effectual destroyers of the Curculio while the latter is above ground in the larva state. It attacks the Curculio grub within the fruit while it yet hangs on the tree, and also enters the fruit which falls to the ground, for the same purpose. In the summer of 1867 I found this same larva on an apple tree of the Early Harvest variety, the fruit of which contained Curculio larvæ from which I subsequently bred perfect Curculios. It is quite active in its movements, and the general color is smoky brown, with a velvety appearance, and for the benefit of those interested I subjoin the technical desription of it:

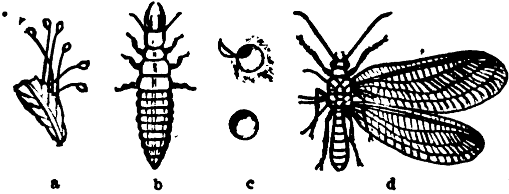
[Fig. 19*.]



CHAULIOGNATHUS PENNSYLVANICUS, DeGeer—*Larva*—Head shining rufous, with two black patches behind, transversely arranged; labrum retractile, dark colored, horny and deeply emarginate with a central tooth; maxillary palpi 4-jointed; labial palpi 2-jointed; antenna 3-jointed, the last joint very small; body rather flattened, of an opaque velvety-brown color above, with a somewhat darker subdorsal line, which is widened on the three thoracic segments; a very distinct lateral spiracle to every segment of the body except the anal one, making altogether eleven pairs of spiracles, all of them exactly alike, and in range with each other. Body beneath suddenly very pale brown, the dividing line between the darker and the paler shades of brown upon each segment being a semicircular curve, with its concavity upward; legs six; a moderate anal proleg; length 0.65 inch.

LACEWING LARVA.—The larvæ of our lacewing flies (*Chrysopa*) seem to have the same habit of attacking Curculio grubs above ground, and great numbers of them were found in the act last summer by Mr. E. Leming, of Cobden, Illinois. The particular species which those belonged to that were occupied in this good manner, has not yet been ascertained, but as they are all known to be cannibals it is possible that more than one species have this praiseworthy habit, though their general food consists of plant-lice. The lacewing flies are common all over the country, and may at once be recognized by their delicate green bodies, lace-like wings and by their brilliant golden eyes; but more especially by a peculiarly disagreeable odor which they are capable of emitting when handled. Our American lacewings, like those of Europe, are capable of emitting this odor, and those who have once experienced it require no description to recall it. One of these

[Fig. 20.]



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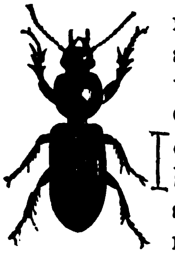
*Explanation of Figure 19—*h* the left upper jaw (*mandible*), *f* the left lower jaw (*maxil*), *c* the under lip (*labium*), *d* the upper lip (*labrum*), *g*, the antenna, *e* one of the legs, *a* the larva natural size, *b* head and first segment of same enlarged.

flies, with the left wings cut off to save space, is represented at Figure 20 *d*, and a typical larva is represented in outline in the same figure at *b*. The female deposits her eggs upon different plants, attaching them at the extremity of a long and very slender foot-stalk (see Fig. 20, *a*). This filament is composed of a viscid matter which she discharges and which quickly hardens on exposure to the atmosphere. We see here, as everywhere else in Nature, an Allwise creative forethought, and a wonderful adaptation to a particular end, in the instinct which prompts, and the power which enables the female lacewing to thus deposit her eggs; for the newly hatched larvæ are so exceedingly voracious that the first hatched would devour the eggs which yet remained unhatched, if they could but reach them.

The larvæ when full-grown spin perfectly round white cocoons (Fig. 20, *c*), by means of a spinneret with which they are furnished at the extremity of the body, and they attach them with threads of loose silk to the underside of fences and in other sheltered situations. These cocoons are of an extraordinary small size compared with the larva which spins them, or with the perfect insect which escapes from them, as may be readily seen by referring to the above figures which bear the relative proportions. After completing the cocoon, I think the larva partly cuts a circle at one side severing the fibers sufficiently to enable their ready separation; for in issuing, the pupa pushes open a small lid, which is cut perfectly smooth, and just spirally enough to allow it to hang at one end as on a hinge. I have also noticed another fact, which, so far as I am aware, has not been recorded by any previous writer, which is, that the insect issues from this cocoon in an active sub-imago state, from which after a few hours the winged fly emerges, leaving behind it a fine silvery-white transparent skin.

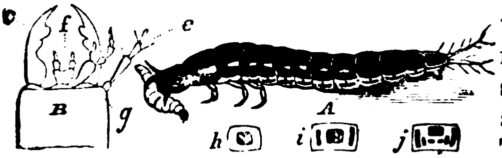
[Fig. 21.]



THE SUBANGULAR GROUND BEETLE—(*Aspidiglossa subangulata*, Chaud.)—This small polished black beetle which is represented enlarged at Figure 21, the hair line at the side showing the natural size, also, in all probability serves us a good turn in helping to diminish the numbers of the Curculio, for Mr. Walsh found him in a peach that had contained Curculio grubs, and as the great family of beetles (*Carabus*) to which he belongs are all cannibals so far as is known, and as he was therefore evidently not inside the peach for the fruit itself, he is to be strongly suspected of being a Curculio hunter. To adopt Shakespeare's mode of reasoning:

> "Who finds the heifer dead, and bleeding fresh,
> And sees fast by a butcher with an axe,
> But will suspect 'twas he that made the slaughter?"

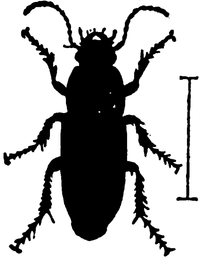
[Fig. 22.*]



The Curculio is not even safe from the attacks of cannibals when underground, for the larva which is represented of the natural size at Figure 22, *A*, seeks it in its hiding place and mercilessly devours it. This larva is of a shining brown-black color above, and dull whitish beneath, and I subjoin herewith the technical description:

Shining brown-black and horny above; thorax immaculate above; sutures and sides of the abdominal dorsum, and all beneath, except the head, pale dull greenish white; a narrow, horny, elongate, abbreviated lateral dark stripe on the dorsum of each of the abdominal joints (4—12); joints 4—10 beneath, each with seven pale-brown horny spots, namely, a large subquadrate spot followed by two small dots in the middle, an elongate spot on each side, and between that and the two medial small dots a second elongate spot, only half the length and breadth of the lateral one (Fig. 22, *j*); joint 11 beneath has only the medial subquadrate spot and the lateral elongate one (Fig. 22, *i*); and joint 12 beneath has nothing but the subquadrate spot (Fig. 22, *h*); legs six, of a pale rufous color; the usual elongate carabidous proleg on joint 12, and on each side of its tip an elongate exarticulate cercus, garnished with a few hairs; antennæ four-jointed; labial palpi two-jointed; maxillary palpi four-jointed. Length 1.25 inch.

[Fig. 23.]



This larva has not yet been bred to the perfect state, but belongs undoubtedly to some one of the Ground-beetles, and not improbably to the Pennsylvania Ground-beetle, (*Harpalus pennsylvanicus*, DeGeer), a dull black species represented at Figure 23. All these Ground-beetles are our friends however, and should always be cherished and not crushed, as they are very apt to be from their habit of crawling and living on the ground. It is safe to infer, that all beetles approaching the annexed form, with active movements, and generally dull colors, which are observed running over the ground, are friends, and should therefore be saved.

Hogs.—Before leaving the subject of natural remedies, I feel in duty bound to say a few words in favor of hogs as Curculio destroyers. Abundant proof might be adduced of their utility in an orchard, especially during the fruit season, but I will mention only the case of Messrs. Winters Bros., of Du Quoin, Ills. These gentlemen, for the past five years, have kept a large drove of hogs in their extensive peach orchard, and have been remarkably exempt from the attacks of the Little Turk. While at their place last fall, I noticed that all the trees were banked up with earth to the height of over a foot, which prevented the hogs from injuring the trunks. They have never had occasion to shake their trees, and consider one hog to the acre sufficient to devour all the fallen fruit, the hogs being fed only during the winter. The efficacy of this hog remedy depends a great deal on how much one's orchard is isolated from those of others, for it is very evident that it will avail but little for one person to destroy all his Curculio while his neighbors are breeding them by thousands, so that they can fly in upon him another year. They would also be of but little service in the case of the cherry, as it remains on the tree when stung. Poultry will be found valuable in an orchard as they also devour the grubs which fall with the fruit.

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* **Explanation of Figure 22.—*B* represents the under side of the head, showing at *c* the upper jaw (*mandible*), at *g* the lower jaw (*maxil*), with its four-jointed feelers (*palpi*), at *f* the lower lip (*labium*), with its two-jointed feelers (*palpi*), and at *e* the *antenna*.**

ARTIFICIAL REMEDIES.—Of the hundreds of patent nostrums, and of the dozens of washes and solutions that have been recommended as Curculio preventives or destroyers, there is scarcely one which is worth the time required to speak of it. Air-slacked lime thrown on the trees after the fruit is formed, is effectual in a certain measure, for though it does not deter the female from depositing her eggs, yet so long as the weather is wet, its caustic properties seem to be imparted to the water and enter the cavity and destroy the egg. But it has no good effect in dry weather. An article went the rounds of the papers last Summer, to the effect that Mr. P. E. Rust, of Covington, Ky., had tried burning tobacco stems with *perfect success!* But a letter of inquiry which I addressed to that gentleman was never answered, although it contained the requisite 3-cent postage stamp, and the tobacco remedy may be placed by the side of the Gas-tar and Coal-tar remedies, which have proved utterly useless. After all, as Dr. Hull, suggests, the successes, so reported, of these remedies, take their origin from insufficient experiment, by persons who are little aware of the casualties to which the Curculio is subject, and who, if they happen to get fruit after applying some particular mixture, immediately jump to the conclusion that it was on account of such mixture.

It may therefore be laid down as a maxim, that the only effectual and scientific mode of fighting the Curculio, aside from that of picking up the fallen fruit, is by taking advantage of its peculiar instinct which on approach of danger prompts it to fall; or in other words to catch it by jarring the tree. The most effectual method of doing this on a large scale is by means of Dr. Hull's "Curculio catcher," and I give a description of it in the Doctor's own words:

"To make a curculio catcher we first obtain a light wheel, not to exceed three feet in diameter, the axletree of which should be about ten inches long. We next construct a pair of handles, similar to those of a wheelbarrow, but much more depressed at the point designed to receive the bearings of the axletree, and extending forward of the wheel just far enough to admit a crossbeam to connect the handles at this point; one-and-a-half inches in the rear of the wheel a second cross beam is framed into the handles, and eighteen to twenty-four inches further back, a third. The two last-named cross-beams have framed to their under-sides a fourth piece, centrally, between the handles, and pointing in the direction of the wheel. To the handles and to the three last named pieces, the arms or ribs to support the canvass are to be fastened. To the front part of the beam connecting the handles in front of the wheel, the ram is attached, this should be covered with leather stuffed with furniture moss, a dozen or more thicknesses of old hat, leather or other substance, being careful to use no more than necessary to protect the tree from bruising. Ascertain the elevation the handles should have in driving, and support them in that position. We now put in place the stretchers or arms, six for each side, which are to receive and support the canvas. We put the front arms in position. These extend back to near the centre of the wheel on each side, and in front of the wheel (for large machines) say six feet, and are far enough apart to receive the largest tree between them on which it is intended to operate. The remaining arms are supported on the handles, and fastened to them and to the two cross and parallel pieces in the rear of the wheel. These are so placed as to divide the space at their outer ends equally between them and the first mentioned stretchers and fastened to the ends of the handles. Next we have ready a strip of half-inch board two an a half wide. One end of this is secured to the forward end of one of the front arms, and in like manner to all the others on one side of the machine, and fastened to the handles. Both sides are made alike. The office of these strips is to hold the outside ends of the arms in position; they also hold the front arms from closing. These outside strips also receive the outside edge of the canvas, which is fastened to them as well as the several arm supports.

"It will be seen that the wheel is nearly in the center of the machine. To cover the opening at this point, a frame is raised over it, which is also covered with canvas. The arms, or stretchers, are so curved that the motion of the machine, in moving from one tree to another, should bring everything falling on the canvas to depressed points, one on each side of the wheel, where openings are made into funnels emptying into pockets or bags, for the reception of insects and fallen fruit. The whole machine should not exceed ten or eleven feet in breadth, by twelve or thirteen in length. These are for large orchard trees; smaller ones could be protected with a much smaller machine. If the frame work has been properly balanced, the machine will require but little lifting, and will be nearly propelled by its own weight.

"This curculio catcher, or machine, is run against the tree three or four times, with sufficient force to impart a decided jarring motion to all its parts. The operator then backs far enough to bring the machine to the center of the space between the rows, turns round and in like manner butts the tree in the opposite row. In this way a man may operate on three hundred trees per hour."

To run this machine successfully three things are necessary: 1st, that the land be decently clean, and not overgrown with rank weeds; 2d, that the orchard be sufficiently large to pay the interest on the prime cost of the machine—about $30; 3d, that the trees have a clean trunk of some three or four feet. I find various modifications of this machine, both in our own State and in Southern Illinois, and in some instances they have been abandoned entirely on account of the injury caused to the trees from the repeated blows given to the trunk. In small orchards it will be found most profitable to drive a spike into the trunk of each tree and to use two sheets stretched on frames, which can both be dragged or carried and placed in position by one man, while a second person gently taps the iron spike with a mallet. To bring the Curculio down, it requires a light, *sudden* tap which jars, rather than a blow which shakes, and if the frames are each made so as to fold in the middle, it will facilitate disposing of those which fall upon it.

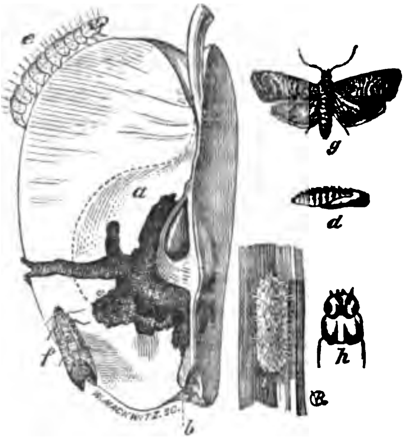
In conclusion, the intelligent fruit-grower can draw many a lesson from this account of the Curculio—already somewhat lengthy. Thus in planting a new orchard with timber surrounding, the less valuable varieties should be planted on the outside, and as the little rascals congregate on them from the neighboring woods in the early part of the season, they should be fought persistently. It will also pay to thin out all fruit that is known to contain grubs, and that is within easy reach; while wherever it is practicable all rubbish and underbrush should be burnt during the winter, whereby many, yes *very many* of them will be destroyed in their winter quarters. As a proof of the value of this measure when it is feasible, I will state that while the peach crop of Southern Illinois was almost an entire failure in 1868, Messrs. Knowles & Co., who have 70 acres of peach orchard 1¼ miles N. W. of Makanda, shipped over 9000 boxes. Though they had a few hogs in the orchard, there were not enough to do any material good, and they think they owe their crop to the fact of having cleared and burnt 100 acres surrounding the orchard, in the early spring of that year; for in 1867 the Curculios had been very bad with them. Judge Kimble, who lives 4 miles N. E. of Cobden, also had a good crop free from their marks, which he attributes to having burnt around the orchard in the spring of the year.

THE CODLING MOTH OR APPLE-WORM—*Carpocapsa pomonella*, Linn.

(Lepidoptera, Tortricidæ.)

The Apple-worm, I find to be quite common all over the State, as it is in almost all parts of the civilized world where apples are grown. Dr. Trimble has devoted page after page to the consideration of this little pest, and yet its whole history and the means of preventing its insidious work may be given in a very few lines. It was originally a denizen of the Old World, but was introduced into this country about the beginning of the present century. The following figure represents it in all its states, and gives at a glance its natural history: *a* represents a section of an apple which has been attacked by the worm, showing the burrowings and channel of exit to the left; *b*, the point at which the egg was laid and at which the young worm entered; *e*, the full

[Fig. 24]



grown worm; *h*, its head and first segment magnified; *i*, the cocoon which it spins; *d*, the chrysalis to which it changes; *f*, the moth which escapes from the chrysalis, as it appears when at rest; *g*, the same with wings expanded. The worm when young is whitish, with usually an entirely black head and a black shield on the top of the first segment. When full grown it acquires a flesh-colored or pinkish tint, especially on the back, and the head and top of first segment become more brown, being usually marked as at Figure 24 *h*. It is sparsely covered with very minute hairs which take their rise from minute elevated points, of which there are eight on each segment. The cocoon is invariably of a pure white color on the inside, but is disguised on the outside by being covered with minute fragments of whatever substance the worm happens to spin to. The chrysalis is yellowish brown, with rows of minute teeth on its back, by the aid of which it is enabled to partly push itself out of its cocoon, when its time to issue as a moth arrives. The moth is a most beautiful object; yet, as has been well remarked by an anonymous writer,* from its habits not being known it is seldom seen in this state, and the apple-grower as a rule, "knows no more than the man in the moon to what cause he is indebted for the basketfuls of worm-eaten windfalls in the stillest weather." Its fore wings are marked with alternate, irregular transverse wavy streaks of ash-gray and brown, and have on the inner hind angle a large tawny brown spot, with streaks of bright bronze color or gold.

The apple is, so to speak, our democratic fruit, and while stone fruit is grown but in certain regions, this is cultivated all over the country. The Codling moth is then even more injurious than the Curculio. Unlike the Curculio, it is mostly two-brooded, the second brood of worms hybernating in the larval state, inclosed in their snug little silken houses, and ensconced under some fragment of bark or other shelter. The same temperature which causes our apple trees to burst their beauteous blossoms, releases the Codling moth from its pupal tomb, and though its wings are at first damp with the imprint of the great Stereotyping Establishment of the Almighty, they soon dry and expand under the genial spring-day sun, and enable each to seek its companion. The moths soon pair, and the female flits from blossom to blossom, deftly depositing in the calyx of each a tiny yellow egg. As the fruit matures, the worm develops. In thirty-three days, under favorable circumstances, it has become full-fed; when, leaving the apple, it spins up in some crevice, changes to chrysalis in three days, and issues two weeks afterwards as moth, ready to deposit again, though not always in the favorite calyx this time, as I have found the young worm frequently entering from the side. Thus the young brood of Codling moths appear at the same time as the young Curculios, the difference being that instead of living on through fall and winter, as do the latter, they deposit their eggs and die, it being the progeny from these eggs which continues the race the ensuing year. Though two apples side by side may, the one be maturing a Curculio, the other a Codling moth, the larva of the latter can always be distinguished from the former by having six horny legs near the head, eight fleshy legs in the middle of the body, and two at the caudal extremity, while the Curculio larva hasn't the first trace of either.

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* Entomological Magazine, London, Vol. I, p. 144.

In latitude 38° the moths make their appearance about the first of May, and the first worms begin to leave the apples from the 5th to the 10th of June and become moths again by the fore part of July. While some of the first worms are leaving the apples, others are but just hatched from later deposited eggs, and thus the two broods run into each other; but the second brood of worms (the progeny of the moths which hatch out after the first of July), invariably passes the winter in the worm or larval state, either within the apple after it is plucked, or within the cocoon. I have had them spin up as early as the latter part of August, and at different dates subsequently till the middle of November, and in every instance, whether they spun up early or late in the year, they remained in the larval state till the middle of April, when they all changed to chrysalids within a few days of each other. Furthermore, they not only remain in the larval state, but in many instances where I have had them in a warm room, they have been *active* throughout the winter, and would always fasten up the cuts made in their cocoons, even where the operation was performed five and six times on the same individual. These active worms perfected themselves in the spring as well as those which had not been disturbed, and this fact would indicate that the torpid or dormant state, so called, is not essential to the well being or the prolongation of life of some insects.

Though the Codling moth prefers the apple to the pear, it nevertheless breeds freely in the latter fruit, for I have myself raised the moth from pear-boring larvæ, and the fact was recorded many years, ago by the German entomologist, Kollar. It also inhabits the fruit of the crab-apple and quince, and is not even confined to pip-fruit, for Dr. T. C. Hilgard, of St. Louis, bred a specimen, now in my cabinet, from the sweetish pulp of a species of screw-bean (*Strombocarpa monoica*) which grows in pods, and which was obtained from the Rocky Mountains, while Mr. Wm. Saunders, of London, Ontario, Canada, has also found it attacking the plum in his vicinity.* This is entirely a new trait in the history of our Codling moth, and is another evidence of the manner in which certain individuals of a species may branch off from the old beaten track of their ancestors. This change of food sometimes produces a change in the insects themselves, and it would not be at all surprising, if this plum-feeding sect of the Codling moth, should in time show variations from the normal pip-fruit feeding type. As Mr. Saunders is a well known entomologist, it is not likely that he has been mistaken in the identification of the species, for the only other worm of this character which is known to attack the plum in America, is the larva of Mr. Walsh's Plum moth (*Semasia prunivora*) which is a very much smaller insect than the Codling moth. Mr. Saunders says that his plum crop suffered considerably from this cause and that the operation appeared to be performed by the second brood, the plums falling much later than those stung by the Curculio—remaining in fact on the tree till nearly ripe. I do not think that this insect has yet acquired an appetite for the plum in the States. As a general rule, there is but a single worm in each apple, but two are sometimes found in one and the same fruit.

REMEDIES.—Though with some varieties of the apple, the fruit remains on the tree till after the worm has left it, yet by far the greater portion of the infested fruit falls, prematurely with the worm, to the ground; hence much can be done toward diminishing the numbers of this little pest by picking up and destroying the fallen fruit as soon as it touches the ground. For this purpose, hogs will again be found quite valuable, when circumstances allow of their being turned into the orchard. Abundant testimony might be given to prove this, but I make room only for the following from Mr. Suel Foster, of Muscatine, Iowa, whom I know to be abundantly capable of forming a proper judgment:

"I have twenty-four acres of my orchards seeded to clover, and last year I turned the hogs in. I now observe that where the hogs ran last year, the apples have not one-fourth the worms that they have on other trees. I this year turned the hogs into my oldest (home) orchard.†"

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* Report of the Commissioner of Agriculture and Arts, of the Province of Ontario, for the year 1868, page 200.

† Transactions Illinois State Horticultural Society, 1867, page 213.

Mr. Huron Burt, of Williamsburg, Mr. F. R. Allen, of Allenton and Mr. Varnum, of Sulphur Springs, have also, each of them, testified to me as to the good effects obtained from allowing hogs the run of their orchards.

There is, however, a more infallible remedy, and one which is always practicable. It is that of entrapping the worms. This can be done by hanging an old cloth in the crotches of the tree, or by what is known as Dr. Trimble's hay-band system, which consists of twisting a hay-band twice or thrice around the trunk of the tree. To make this system perfectly effectual, I lay down the following as rules: 1*st*, *the hay-band should be placed around the tree by the first of June, and kept on till every apple is off the tree*; 2*d*, *it should be pushed up or down, and the worms and chrysalids crushed that were under it, every week, or at the very latest, every two weeks*; 3*d*, *the trunk of the tree should be kept free from old rough bark, so as to give the worms no other place of shelter, and*, 4*th*, *the ground itself should be kept clean from weeds and rubbish.* But, as already stated on a previous page, many of the worms of the second brood yet remain in the apples even after they are gathered for the market. These wormy apples are barrelled up with the sound ones, and stored away in the cellar or in the barn. From them the worms continue to issue, and they generally find plenty of convenient corners about the barrels in which to form their cocoons. Hundreds of these cocoons may sometimes be found around a single barrel, and it therefore becomes obvious that, no matter how thoroughly the hay-band system had been carried out during the summer, there would yet remain a sufficiency in such situations to abundantly continue the species another year. And when we consider that every female moth which escapes in the spring, lays from two to three hundred eggs, and thus spoils so many apples, the practical importance of thoroughly examining, in the spring of the year, all barrels or other vessels in which apples have been stored becomes at once apparent. It should, therefore, also be made a rule to destroy all the cocoons which are found on such barrels or vessels either by burning them up or by immersing them in scalding hot water.

Now, there is nothing in these rules but can be performed at little trouble and expense. Their execution must henceforth be considered a part of apple-growing. Let every apple-grower in Missouri carry them out strictly, and see that his neighbors do likewise, and fine, smooth, unblemished fruit will be your reward!

The philosophy of the hay-band system is simply that the worms, in quitting the fruit, whether while it is on the tree or on the ground, in their search for a cozy nook, in which to spin up, find the shelter given by the hay-band just the thing, and in ninety-nine cases out of a hundred, they will accept of the lure, if no other more enticing be in their way. I have thoroughly tested this remedy the past summer, and have found it far more effectual than I had anticipated, wherever the above rules were recognized. Under two hay-bands which were kept around a single old isolated tree, through the months of June, July and August, I found every week of the last two months an average of fifty cocoons.

I have often smiled in my journeyings through the State, to see the grin of incredulity spread over the face of some unsophisticated farmer as I recounted the natural history of this Codling moth, and urged the application of the hay-band. Magic spell or fairy tale could not more thoroughly have astounded some of them than the unmasking of this tiny enemy and the revealing of the proper preventive.

The burning of fires has been recommended, under the supposition that the moths will fly into them and get destroyed. I have no faith whatever in the process, so far as regards this particular species, for though it is true that the moths fly and deposit their eggs in the evening, I do not believe they are attracted to the light, as are some others, for I have never been able to thus attract any myself.

CUT-WORMS.

(Lepidoptera Noctuidæ.)

THE NATURAL HISTORY OF TWELVE DISTINCT SPECIES.

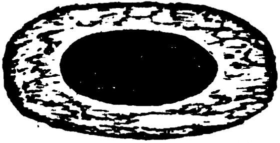
There are several different kinds of insects that are known by the popular name of cut-worm. Thus, the White grub, or larva of the common May beetle (*Lachnosterna quercina*, Knoch), and the different species of wire-worms, the larvæ of our Click beetles (*Elater* family) are all called cut-worms in some part or other of the United States. But I shall confine the term to those caterpillars, which, for the most part, have the habit of hiding just under the surface of the earth during the day, and feeding either on the roots, stems or leaves of plants during the night.

Most of these caterpillars have the very destructive habit of cutting, or entirely severing the plant on which they feed. just above or below the ground. On this account they have received the name of *Cut*-worms, and not because when cut in two, each end will reproduce itself as some people have supposed; for although some polyps and other animals belonging to the great class RADIATA in the animal kingdom, have this curious power of multiplying by division, it is not possessed by any insect, and after having mutilated one of these cut-worms, the farmer need never fear that he has thereby increased, instead of having decreased their number. From this habit of cutting, they prove a far greater nuisance than if they were to satisfy their appetites in an honest manner. In the latter case we might feel like letting them go their way in peace, but as with the Baltimore oriole, which abrades and ruins a hundred grapes where it would require one for food, we feel vexed at such wanton destruction of our products, and would gladly rid ourselves of such nuisances.

These caterpillars are called surface caterpillars in England, in which country, as well as on the continent of Europe, they have long been known to do great damage to vegetables, and especially to the cabbage, mangel-wurzel and turnip. There are many different species and they vary in size and detail of markings; but all of them are smooth, naked and greasy-looking worms of some shade of green, gray, brown or black, with a polished, scaly head, and a shield of the same color on the top of the first and last segments; while most of them have several minute shiny spots on the other segments, each spot giving rise to a minute stiff hair. They also have the habit of curling up in a ball when disturbed, as shown at Figure 2, in Plate 1. They produce moths of sombre colors which are known as Owlet or Rustic moths, and the species that have so far been bred in this country, belong to one or other of the four genera, *Agrotis*, *Hadena*, *Mamestra* or *Celæna*. These moths fly, for the most part by night, though some few of them may be seen flying by day, especially in cloudy weather. They frequently, even in large cities, rush into a room, attracted by the light of gas or candle, into which they heedlessly plunge and singe themselves. They rest with the wings closed more or less flatly over the body, the upper ones entirely covering the lower ones, and these upper wings always have two, more or less distinctly marked spots, the one round, the other kidney-shaped.

The natural history of most of these cut-worms may be thus briefly given. The parent moth attaches her eggs to some substance near the ground, or deposits them on plants, mostly during the latter part of summer, though occasionally in the spring of the year. Those which are deposited during late summer, hatch early in the fall, and the young worms, crawling into the ground feed upon the tender roots and shoots of herbaceous plants. At this time of the year, the worms being small and their food plentiful, the damage they do is seldom noticed. On the approach of winter they are usually about two-thirds grown, when they descend deeper into the ground, and, curling themselves up, remain in a torpid state till the following spring. When spring returns, they are quite ravenous, and their cutting propensities having fully developed, they ascend to the surface and attack the first green succulent vegetation that comes in their way. When once full grown they descend deeper into the earth, and form for themselves oval chambers, in which they change to chrysalids, as shown in the annexed cut (Fig. 25). In this state they remain from two to four weeks, and finally come forth as moths, during the months of June, July and August, the chrysalis skin, being in most cases so thin, that it is impossible to preserve it. These moths in time lay eggs, and their progeny goes through the same cycle of changes. Some species, however, as I shall presently show, are most likely two-brooded, while others pass through the winter in the chrysalis state.

[Fig. 25].



Dr. Fitch states that he had great difficulty in breeding these cut-worms to the perfect moths, "as the worms on finding themselves imprisoned, hurriedly crawl around and around the inner side of their prison, night after night, until they literally travel themselves to death." Consequently the natural history of but one or two of them has hitherto been known. I have found, however, that by giving them the proper conditions they are not so very difficult to breed, and after giving some account of a certain class of cut-worms which have the habit of climbing up trees, I will briefly describe those species which I have traced through their transformations, so that they may be readily recognized, and afterwards suggest the proper remedies.

CLIMBING CUT-WORMS.

Orchardists in spring frequently find the hearts of their fruit buds —on young trees especially—entirely eaten out and destroyed, and this circumstance is attributed to various causes, winged insects, beetles, slugs for instance; or even to late frosts, unsuitable climate, etc. Never have cut-worms received the blame, all of which should be ascribed to them, for the game hold of many species on a sandy soil in early spring, is the fruit tree. This is a very important fact to fruit raisers, and let those who have essayed to grow the dwarf apple and pear, on a sandy soil, and have become discouraged, as many have, from finding their trees affected each year in this way, take hope; for knowing the cause, they may now easily prevent it.

These climbing cut-worms will crawl up a tree eight or ten feet high, and seem to like equally well the leaves of the pear, apple and grape.

They work during the night, always descending just under the surface of the earth again at early dawn, which accounts for their never having been noticed in this their work of destruction in former years. They seldom descend the tree as they ascend it, by crawling, but drop from the bud or leaf on which they have been feeding; and it is quite interesting to watch one at early morn when it has become full fed and the tender skin seems ready to burst from repletion, and see it prepare by a certain twist of the body for the fall. This fact also accounts for trees on hard, tenacious soil, being comparatively exempt from them, as their instinct doubtless serves them a good turn either in preventing them from ascending or by leading the parent moth to deposit her eggs by preference on a light soil.

These facts were published in the *Prairie Farmer* of June 2, 1866, accompanied with descriptions by myself of three of the worms that were found to have this habit; and the observations were made on Mr. J. W. Cochran's farm at Calumet, Illinois. In speaking of these same climbing cut-worms, in the same article Mr. Cochran says:

"They destroy low branched fruit trees of all kinds, except the peach, feeding on the fruit buds first, the wood buds as a second choice, and preferring them to all other things, tender grape buds and shoots (to which they are also partial) not excepted—the miller always preferring to lay her eggs near the hill or mound over the roots of the trees in the orchard; and if, as is many times the case, the trees have a spring dressing of lime or ashes with the view of preventing the May beetles' operations, this will be selected with unerring instinct by the miller, thus giving her larvæ a fine warm bed to cover themselves up in during the day from the observations of their enemies. They will leave potatoes, peas and all other young green things for the buds of the apple and the pear. The long, naked young trees of the orchard are almost exempt from their voracious attacks, but I have found them about midnight, of a dark and damp night well up in the limbs of these. The habit of the dwarf apple and pear tree however just suits their nature, and much of the complaint of those people who can not make these trees thrive on a sandy soil, has its source and foundation here, though apparently utterly unknown to the orchardist. There is no known remedy; salt has no properties repulsive to them, they burrow in it equally as quick as in lime or ashes. Tobacco, soap and other diluted washes do not even provoke them; but a tin tube 6 inches in length, opened on one side and closed around the base of the tree, fitting close and entering at the lower end an inch into the earth, is what the lawyers would term an effectual estopper to further proceedings.

"If the dwarf tree branches so low from the ground as not to leave 6 inches clear of trunk between the limbs and ground, the limbs must be sacrificed to save the tree—as in two nights four or five of these pests will fully and effectually strip a four or five year old dwarf of every fruit and wood bud, and often when the tree is green, utterly denude it of its foliage. I look upon them as an enemy to the orchard more fatal than the canker worm when left to themselves, but fortunately for mankind more surely headed off."

Harris gives us the earliest intimation of this climbing character in these worms, on page 450 of his work, where he says, that "in the summer of 1851, an agricultural newspaper contained an account of certain naked caterpillars, that came out of the ground in the night, and crawling up the trunks of fruit-trees, devoured the leaves, and returned to conceal themselves in the ground before morning." But until the above article, from which I have quoted, was published, the fact was not generally known and none of the species had been identified.

They seem to prefer the apple, pear and grape-vine, though they also attack the blackberry, raspberry, currant, and even rose-bushes and ornamental trees. Nor do they confine themselves to dwarf trees, as the following extract from a letter by John Townley, of Marquette Co., Wis., to the *Practical Entomologist* for March, 1867, abundantly proves.

"During the last two years at least, young apple-trees in this locality have been much injured by having their buds destroyed. My observations last spring led me to conclude, that a worm very like the cut-worm, and having the same habit of hiding just beneath the surface of the soil during the day and feeding by night, was the cause of the mischief. * * * * * *

"Soon after snow had gone in 1865, I pruned a lot of apple-trees then four years planted. The wood at the time seemed alive and sound. When older trees were coming into leaf, these remained almost destitute of foliage; and on examining them, it was found, that most of the buds, especially those on shoots formed the preceding year, were gone—removed as clean as if they had been picked out with a point of a knife. The bark in small patches near the ends of some of the shoots had also been eaten or chipped off. As many small birds had been seen about the trees, the conclusion was arrived at that they had probably eaten the buds. In the fall, mounds of earth were thrown up around the stems of these trees, and of another lot two years planted. These mounds were being leveled on the 6th of May last; and soon after commencing the work, several large cut-worms like grubs were noticed. This, coupled with the fact, that in the preceding spring, I had caught a worm like these in the very act of eating out a bud high up the stem of a young Catalpa, around which I had thrown a blanket the evening before, to shield it from frost, induced me to suspect that they and not the birds destroyed the buds. This led to an examination of the untouched mounds; and in the soil immediately surrounding the stem of each tree, I found from about five to ten of these worms. Twenty-three were taken from the soil around a plant of the Rome Beauty apple. * * * On a warm dewy night about the middle of the month, I took a lamp and suddenly jarred several of the trees; when some of these worms came tumbling to the ground. The evidence against them would have been more conclusive, if I had searched the branches and found them there and at work. That however, I omitted to do. I have had fruit trees planted here sixteen years, but never had the buds destroyed so as to attract my attention before the last two years; nor have I had any complaints from my neighbors on this point, except during that time. Orchards are not very common here, but in three others in this town, I know young trees have been injured as in my own during the last two years. * * * I grow no dwarf apples; mine are all standard trees worked on the ordinary apple stock."

Mr. Cochran also found them last spring, up among the highest branches of his standard as well as his dwarf trees.

The subject is all important to the orchardist, and to those especially who have young and newly planted trees on a light soil; for there are many who have had their trees injured by the buds being devoured in this manner, who never dreamed of preventing such an occurrence, for the reason that the mischief was attributed to birds. Thus our Quail, Purple-finch, and many other birds, have too often unjustly received the execrations of the culturist, which that evil genius the cut-worm, alone deserved. To understand an enemy's foible is to have conquered, and when we learn the source of an evil it need exist no longer. The range of these climbing worms seems to be wide, for we have undoubted evidence of their attacking the grape-vine, even in California, and I have found two species in Missouri, which have the same habit. Climbing cut-worms frequently have the same habit of severing plants, as those which have never been known to climb, and I very much incline to believe that this habit is only acquired in the spring time, and most cut-worms will mount trees if they are forced to do so, by the absence of herbaceous plants.

THE VARIEGATED CUT-WORM.—Pl. 1, Figs. 1, 2, 3 and 4.

(Larva of the Unarmed Rustic, *Agrotis inermis*, Harris.)

During the latter part of May, Mr. Isidor Bush, of Bushburg, Mo., brought me several greasy-looking worms, which had been feeding on, and doing considerable damage to a lot of young Creveling grapevines, which he had in cold frames. As I ascertained afterwards, upon visiting Mr. Bush's place, they lay concealed during the day, just under the surface of the rich earth, contained in the frames, and mounted the vines to feed, during the night time. The weather being warm, Mr. B. at my suggestion, threw open the frames during the day and allowed the chickens to get in them, and two days after doing this, there was not a worm to be found. By the 30th of May, these worms had grown to be of great size, measuring nigh two inches in length. When full grown they are mottled with dull flesh-color, brown and black, with elongated, velvety-black marks each side, as shown at Plate 1, Figure 2. The head is light gray and mottled, and marked as shown in Figure 3, and each segment on the back appears as in Figure 4 of the same plate.

About the time these worms were completing their growth, they having most likely developed earlier than usual, in the unnatural heat of the frames, I received from J. M. Shaffer, Secretary of the Iowa State Agricultural Society, some eggs which he found on a cherry twig. These eggs were quite small, of a pink color, with ribs radiating from a common centre, and were deposited in a batch. Exactly similar eggs, found on an apple twig, were presented to the Alton Horticultural Society, at its June meeting, by Mr. L. W. Lyon, of Bethalto, Ills.; while I subsequently found a batch of the very same eggs on a White mulberry LEAF, taken from a tree growing near St. Louis. Between the 24th and 30th of May, the young hatched from these eggs, in the shape of minute, thread-like worms of a dirty yellow color, and covered with the spots, already spoken of as occurring on all cut-worms, which are at this time in this species quite dark and conspicuous. In this early stage of their growth, they did not hide themselves in the ground, and had, furthermore, the peculiarity of looping up the back when in motion, in the same manner as does the Canker-worm, and as do all other geometers or span worms. After the first moult, which took place six days after hatching, the dark spots became almost obliterated, the characteristic markings of this same Variegated cut-worm which I had received from Mr. Bush, began to appear, and they lost their looping habit. At this time they grew at an incredible rate, becoming thicker in proportion to their length as they grew older, and by the 15th of June, those which hatched on the 24th of May, had shed their skins four times, and gone into the ground, where they formed oval cocoons of earth, and in two days more were changed into chrysalids. By the 20th of June the moths began issuing, thus requiring but 35 days to go through all their transformations.

These worms were very voracious, and after the first moult, showed the true cut-worm characteristic of concealing themselves during the day, and feeding at night. Moreover, they proved to be quite universal feeders, for while I fed them, when young, on cabbage and grapevine leaves, they flourished exceedingly, the latter part of their lives, on the leaves of the White mulberry; and on the 16th of June, I dug up from my garden, two full grown specimens of this same kind of worm, which produced the same species of moth, each of them having severed a young lettuce plant. From the foregoing, it is manifest that all cut-worm moths do not deposit their eggs on the ground, and from the fact that these eggs were found, in one instance, on a leaf, so early in the season, they were undoubtedly deposited in the spring by a moth which must have passed the winter either in the chrysalis or moth state; and as the insect goes through its transformations so rapidly, there are most likely two broods during the year. From the foregoing experience, and from the fact that most other moths attach their eggs to different substances, I think it not unlikely that our cut-worm moths do the same, as a general rule, instead of depositing them in, or on the ground, as has heretofore been supposed; and Mr. Cochran has related to me a curious incident which bears me out in this belief. He is in the habit of gathering, during the winter, all crumpled leaves and egg-masses which he finds in his orchard, and of placing them in a drawer in his secretary. Last Spring he was astonished to find several half-grown cut-worms in this drawer, they having evidently hatched from some of the eggs, and fed entirely on some apples which chanced at that time to be in the drawer.

The moth produced from this cut-worm is represented at Plate 1, Figure 1. Its general color is a dark brownish-gray, some specimens being almost black along the front edge of the upper wings, while others have this edge of a dull golden-buff color. The NOCTUIDÆ, to which our cut-worm moths belong, have not yet been worked up by any one in this country, and as they are all of sombre colors, and as the species, in many instances, very closely resemble each other, it is not an easy matter to properly determine them. The species under consideration, is apparently quite common here, and yet Mr. A. Grote of New York, who made a trip to Europe last year, for the purpose of comparing our American moths with those in the British museum, and in other European collections, took a specimen with him and brought it back unnamed. In the collection of Mr. A. Bolter, of Chicago, it is marked *Agrotis saucia*, Treitschke, while Mr. Cresson informs me that in the collection of the American Entomological Society, at Philadelphia, it is named *æqua*, but without authority. Harris's description of *inermis* (Inj. Insects, p. 444), brief and insufficient as it is, agrees with some of the individuals, and, as it is said to be the counterpart of *æqua* which is an European species, I have concluded, rather than to create more synonyms, to redescribe it below, under this name. Individuals among the numerous specimens which I bred from the same batch of eggs, differ greatly from one another, and I find this to be the case with all owlet moths. Indeed, with the present species, a description taken from any single specimen would scarcely suffice for any of the others, and it is not at all unlikely that this species has received different names from different authors.

AGROTIS INERMIS, Harris—*Larva*—Length, when full grown, 2 inches. Finely mottled with dull, carneous-brown and black, and having dark velvety longitudinal marks along subdorsal and stigmatal region (see Pl. 1, Fig. 2); segment 11 somewhat ridged and abruptly divided transversely by velvety black and carneous. Lighter laterally than above. A carneous stripe below stigmata. Venter and legs speckled glaucous. Dorsum of segments marked as in Plate 1, Figure 4; Head light gray, and marked as in Plate 1, Figure 3. Cervical shield obselete.

Chrysalis.—Of normal form, deep mahogony brown, with a single point at extremity.

Perfect insect.—Average length 0.80; alar expanse 1.80. Ground color of fore wings gray-brown, marked as in Plate 1, Figure 1. A most variable species, sometimes washed with dull carneous, at others with light buff, but always marked with more or less smoky black. Costal region, head and thorax, sometimes very black, at others bright golden-buff. Spots usually lighter than wing, though sometimes concolorous. Basal half and transverse lines more or less distinct, especially at costa, geminate, their middle space, usually lighter than the ground color. Hind wings pearly white, with a very slight pink tint in the middle, shaded behind and veined with smoky brown.

Under surface of the wings, the least variable and most characteristic feature, that of fore-wings being mouse-gray with a distinct ferruginous spot in the middle at base, and a lighter strip running from this spot to the posterior angle; the arcuated band very distinct and geminate at costa, and the whole surface pearly and especially the light strip at interior margin which in certain lights reflects all the prismatic colors. That of hind wings pearly white in the middle, darker near the margins, distinctly freckled along anterior margin, where the arcuated band is very distinct, while in the middle of the wing it is represented by distinct black strokes on the veins.

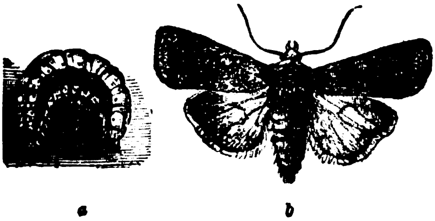
Described from 25 bred specimens.

THE DARK-SIDED CUT-WORM.

(Larva of the Cochran Rustic, *Agrotis Cochranii*, Riley.)

This worm is one of the most common of those which have the climbing habit. It is represented in the annexed Figure 26, at *a*. The general color is dingy ash-gray, but it is characterized more especially by the sides being darker than the rest of the body. When young, it is much darker, and the white, which is below the dark lateral band, is then cream-colored, and very distinct. It produces

[Fig. 26.]



a moth which may be known as the Cochran Rustic, and was first described in the *Prairie Farmer* of June 22, 1867. Speaking of the depredations of this worm, Mr Cochran says:

"In the beginning of the evening its activity is wonderful; moving along from limb to limb swiftly, and selecting at first only the blossom buds, to one of which having fastened, it does not let go its hold until the entire head is eaten out, and from this point, so thorough is its work, no latent or adventitious bud will ever again push. From a six-year old fruit tree, I have, on a single night, taken seventy-five of these worms, and, on the ensuing evening, found them well nigh as plenty on the same tree. When all the blossom buds of a tree are taken, it attacks with equal avidity the leaf buds. It is no unusual thing to find small trees with every bud that had pushed, from first intentions utterly destroyed, and frequently young orchards the first season planted on sandy grounds, lose from 50 to 75 per cent. of their trees; sometimes those remaining will be so badly injured as to linger along for a few years, fruiting prematurely each season, and then die, utterly drained of their vital principle by this dreadful enemy. The instinct of the perfect insect, like that of all insects injurious to vegetation, leads it unerringly to deposit its eggs where they will hatch out from the warmth of the sun, and where the larvæ is nearest to that food which is necessary to its existence: hence I never yet have found the eggs upon clay, or heavy cold grounds of any description, and on my carefully placing them in such situations they failed to hatch out. Can there be a stronger argument used for the appointment of a State Entomologist than the fact, that the habits of this enemy of horticulture, that has ruined millions of dollars worth of fruit trees in our country, has until recently been entirely unknown ? I doubt whether one fruit grower in five hundred is even now aware of the presence of this curse on his grounds. There is not an orchard upon the sands of Michigan, or the light timber openings of Indiana, or the sandy ridges of our own State, but that has suffered greatly, many of them entirely ruined by its depredations. It is far more destructive to fruit trees than any other insect, infinitely more so than the canker worm, but unlike the other depredators of our orchard trees, it is easily kept in check, and at small expense permanently eradicated."

This species remains longer underground in the chrysalis state, than the preceding, and there is but one brood each year, the moths appearing through the months of July and August. The moth which is represented at Figure 26, *b*, is of a light warm gray color, and shaded with brown and umber.

AGROTIS COCHRANII, Riley—*Imago*.—Fore wings of a light warm cinereous, shaded with vandyke brown and umber, the terminal space, except at apex, being darker and smoky. Basal, middle and limbal areas of almost equal width, the middle exceeding somewhat the others. A geminate dark basal half-line, usually quite distinct. Transverse anterior geminate, dark, somewhat irregularly undulate, and slightly obliquing outwards from costa to interior margin. Transverse posterior geminate, the inner line being dark, distinct and regularly undulate between the nerves, while the outer line is plain and much paler; it is arcuated superiorly and inversely obliques for two-thirds its width. Orbicular and reniform spots of normal shape, having a fine, dark annulation, which is however obsolete in both, anteriorly; the orbicular is concolorous with the wing, whilst the reniform has a dark inner shade with a central light one, and forms with the transverse posterior a somewhat oval spot which is also dark. Median shade dark and distinct interiorly, shading off and becoming indistinct in center of wing, and quite dark between the two spots, giving them a fair relief. Subterminal line single, light, acutely and irregularly dentate, with an inner dark shade, but warmer than that of terminal space. Terminal line very fine, almost black, slightly undulate. Fringes of same color as wing, with a light central line, having an outer dark coincident shade. A dark costal spot in basal area; at termini of the usual lines, and two light ones in subterminal space. In some specimens one or two fine dark sagittate marks are disçernable, and also a fine black claviform mark. Hind wings: whitish, with a darker shade along posterior margin. Under surface of fore wings somewhat lighter than the upper surface and pearlaceous interiorly, with a smoky arcuated band—more definite near the costa than elsewhere—and a tolerably distinct lunule. Under surface of hind wings concolorous; slightly irrorate with brown anteriorly and posteriorly, and with an indistinct lunule and band. Antennæ, prothorax, thorax, tegulæ and body of same color as primaries, the prothorax having a darker central line, and in common with the tegulæ a carneous margin. Under surface lighter; legs with the tarsi spotted.

This moth, in its general appearance, bears a great resemblance to *Hadena chenopodii*, but the two are found to differ essentially when compared. From specimens of *H. chenopodii*, kindly furnished me by Mr. Walsh, and named by Grote, I am enabled to give the essential differences, which are: 1st. In *A. Cochranii*, as already stated, the middle area exceeds somewhat in width either of the other two, while in *H. chenopodii* it is but half as wide as either. 2d. In the *Agrotis* the space between the spots and between the reniform and transverse posterior is dark, relieving the spots and giving them a light appearance, whilst in the *Hadena* this space is of the same color as the wing, and the reniform spot is dark. The claviform spot in the *Hadena* is also quite prominent, and one of its distinctive features, while in the *Agrotis* it is just about obsolete.

There are specimens that seem to be intermediate between these two, but all those bred by me, both male and female, were quite constant in their markings, and their intermediates will doubtless prove to be distinct species or mere varieties.

Larva—Length 1.07 inches. Slightly shagreened. General color, dingy ash-gray, with lighter or darker shadings. Dorsum light, inclining to flesh color, with a darker dingy line along its middle. The sides, particularly along the sub-dorsal line are of a darker shade. On each segment there are eight small, black, shiny, slightly elevated points, having the appearance of black sealing-wax, from each of which originates a small black bristle. The stigmata are of the same black color, and one of the black spots is placed quite close to them anteriorily. Head shiny and of the same dingy color as the body, with two darker marks, thick and almost joining at the upper surface, becoming thinner below and diverging toward the palpi. The upper surface of first segment is also shiny like the head. Ventral region of the same dingy color, but lighter, having a greenish tinge anteriorly and inclining to yellow under the anal segment. Legs of same color. It has a few short bristles on the anterior and posterior segments.

Chrysalis.—Length 0.70 of an inch. Light yellowish brown with a dusky line along top of abdomen. Joints, especially of the three segments immediately behind the wing-sheaths, dark brown. The brown part of these three segments, minutely punctured on the back. Eyes dark brown, and just above them, a smaller brownish spot. Two quite minute bristles at extremity.

Described from numerous bred specimens.

THE CLIMBING CUT-WORM—Pl. 1, Figs. 5, 6 and 7.

(Larva of the Climbing Rustic, *Agrotis scandens*, N. Sp.)

This is another of the most common species having the climbing habit. It occurs in at least five different States, for Mr. Walsh informs me that it is the species referred to by Mr. Townley, of Marquette county, Wisconsin, and I have found it with the same pernicious habit on Mr. Jordan's nursery at St. Louis, in our own State; while it was even more numerous, last spring, in North Illinois, North Indiana and West Michigan, than the preceding species, as I am informed by Mr. Cochran, and by Mr. H. D. Emery, of Chicago, who both sent me great numbers of specimens during the last week of April. The following interesting letter accompanied those which were received from the last named gentleman:

"I made a nocturnal visit to Mr. Cochran's place, Monday night, for the purpose of observing the workings of this pest, and spent about 3½ hours, until 1 o'clock in the morning, at the job. I found on some single dwarf trees over 50 at a time, and from that down, and they were on both apple, pear, peach and cherry. They commence ascending the trees soon after dark, and are found the most plenty from 11 to 12, some remaining on the trees until daylight, as I found several at 4 o'clock in the morning. Their first drive seems to be the terminal bud, and when these are all gone, they take side buds or even the bark of the tree in many cases, as you will see by the small twigs sent herein. You will see they are of different sizes. Some trees were entirely despoiled of the terminal buds. After they have eaten their fill, they seem to let themselves off the limb by a short web, and drop to the ground. We have found a large number of the worms attacked by the bug found in the tin box*. They would pierce the worm and suck him dry, and frequently two of them were hold of one worm. There were also numbers of spiders about the trees, of various sizes and kinds, all alive and alert, and apparently annoying if not preying upon the worms. Also a beetle, of which I send two specimens, was very active on the ground under the trees, apparently after prey †. The worms were the most abundant on the light sandy soils, and less frequent as the ground grew hard or clayey, and where it was pretty much all clay, scarcely one could be found. The tin tubes placed around the trunks of the trees, when properly adjusted, were a perfect protection. The injury they have already done is very great."

Mr. Cochran, speaking of the same worm, says: "Some trees were literally covered with them. Scarcely a bud but that had its worm, and, returning towards 10 o'clock, to those trees which we had in the early part of the night examined, we found others had come as abundantly as before. I have observed that they are actually ruining the young orchards along the Lake shore, and, strange as it may appear, their owners do not know what is doing the mischief. At Hyde park, where there are many handsome country residences with grounds of great beauty, this worm has been especially injurious to their young shrubbery."

This worm is represented at Plate 1, Figure 7. Its general color is a very light yellowish-gray, variegated with dirty bluish-green, and when filled with food it wears a much greener appearance than otherwise. In depth of shading it is variable however, and the young worm is of a more uniform dirty whitish-yellow, with the lines along the body less distinct but the shiny spots more so than in the full grown ones. Mr. Cochran informs me that on the apple tree, when this worm has fed out its bud, the work is so effectually done, that no adventitious or accessory bud ever starts again from the same place; the worm, as it were, boring into the very heart of the wood and effectually destroying the ability of the tree to react, at such a point, in the formation of a new bud, and that consequently a tree that is once stripped generally dies, and that this occurs more frequently on small or dwarf trees, where the buds are few, and 3 or 4 worms in a single night can eat out every one. But I have noticed that with the grape-vine this is not generally the case, as a new bud almost always appears where one has been eaten off.

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* The bug was the Spined Soldier bug. (*Arma spinosa*, Dallas). See Figure 54.

† The Incrassated Geopinus (*Geopinus incrassatus*, Dej.) a beetle about ½ inch long and of the color and polished appearance of thin glue.

Great numbers of these worms which I reared to the moth state, were fed promiscuously on apple and grape-vine leaves. They began entering the earth on the 20th of May, and generally issued as moths nine days after thus disappearing; the last moth having issued on the 29th of June.

The moth produced from this worm is easily distinguished from most other owlet moths by its peculiar color. It seems allied to *Agrotis cursoria* of Europe, and also greatly resembles one that was described as *A. murænula*, by Mr. Grote, and figured in Volume 1, Number 4, of the American Entomological Transactions. Upon submitting specimens to Mr. Grote, however, he informed me that it is distinct and undescribed, and I have therefore named it the Climbing rustic (*Agrotis scandens*). It is well represented with extended wings at Plate 1, Figure 5, and with closed wings at Figure 6. The general color of the upper wings is a pearly bluish-gray, while the under wings are pearly white; but as with the other species, it varies greatly in color and appearance, and as I could pick out, from 30 individuals, at least 4 which, if taken singly would doubtless be described as distinct species, it is not unlikely that Mr. Grote's *murænula*, may prove identical with it after all.

AGROTIS SCANDENS, N. Sp.—*Larva.*—Average length when full grown 1.40. Ground-color very light yellowish gray, variegated with glancous in the shape of different sized patches, which are distinctly seen under the lens, to be separated by fine lines of the light ground color. A well defined dorsal and less distinct subdorsal and stigmatal line, caused by these patches becoming larger and darker; another and still less distinct line of the same kind under stigmata. The dorsal line frequently with a very fine white line along its middle, especially at sutures of segments. Piliferous spots in the normal position; those above black, those at the sides lighter. Stigmata black. Head and cervical shield tawny, the latter with a small black spot each side, the former with two in front, and two eye-spots each side. Caudal plate tawny, speckled with black. Venter and legs glancous. Bristles fine and small. Filled with food it wears a much greener appearance than otherwise, while when young it is of a more uniform dirty whitish-yellow, the lines less distinct but the piliferous spots proportionately larger. Head quite variable in depth of shade.

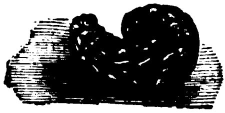
Perfect Insect.—Average length 0.70; alar expanse 1.50. General color of fore wings very light pearly bluish-gray, with a perceptible deepening posteriorly. Quite variable, sometimes of a more decided blue, at others inclining to buff as in *Leucania unipunctata*, Haw. Markings, when distinct, as in Plate 1, Figures 5 and 6. With the exception of the reniform spot and subterminal line, however, they are usually distinct only on costa, being either indistinct or entirely obsolete on the rest of the wing. The subterminal line is light, with a more or less dark diffuse shade each side, which, in some instances, forms into sagittate spots. A black stain at the lower part of reniform spot forms a most distinctive character. Hind wings very pale and lacking the bluish cast of fore wings; lunule distinct, and a dark shade, enclosing a lighter mark, as in *Heliothis*, along posterior margin. Eyes dark; head and thorax same as fore wings; abdomen same as hind wings. The whole under surface the same as hind wings above, the lunules and arcuated bands faintly traced, the fore wings having a darker shade in the middle.

Described from 30 bred specimens.

THE W-MARKED CUT-WORM.—Pl. 1, Fig. 13.
(Larva of the Clandestine Owlet moth, *Noctua clandestina*, Harris.)

Another cut-worm which has this same habit of climbing trees, I have named the W-marked cut-worm, on account of the characteristic markings resembling this letter, which it has on its back. Its general color is ash-gray, inclining on the back and upper sides to dirty yellow, and the annexed Figure 27 gives a correct view of it. This species, so far as I have observed, though it has been caught in the act of eating apple buds, is but seldom found very high up on trees, but seems to prefer to attack low bushes, such as currants, on which I have often found it. It occurs abundantly on a species of wild endive (probably *Cichorium sativa*), under the broad leaves of which it frequently nestles during the day, without entering into the ground. Harris quotes a communication from Dr. F. E. Melsheimer, of Dover, Pa., in which this same worm is said to attack young corn, and to feed indiscriminately on all succulent plants, such as early sown buckwheat, young pumpkin-plants, young beans, cabbage plants, and many other field and garden vegetables. Mr. Glover, of the Department of Agriculture, has also found it to attack wheat, and I have found it quite injurious to young cabbages. In feeding, it frequently drags its food under stones and other places of concealment. The young worms are of a more decided gray than the older ones, with the black W-shaped marks less distinct, and subsist, for the most part, on grasses.

[Fig. 27.]



The moth produced from this worm is illustrated at Plate 1, Figure 13. It appears during the latter part of June, and is, consequently, one of our earliest. It is of a dark ash-gray color, with the wavy bands but faintly traced. The two ordinary spots are small, narrow, and usually connected by a fine black line. The hind wings are dirty brownish-white, somewhat darker behind. It may be popularly known as the Clandestine Owlet moth, and was named *Noctua clandestina*, by Harris, though it might be placed with more propriety in the genus *Graphiphora*.

NOCTUA CLANDESTINA, Harris.—*Larva*—Length, when full grown, 1.15 of an inch. General color ash-gray, inclining on the back and upper sides to dirty yellow. Finely speckled all over with black and brown spots. Along the dorsum there is a fine line of a lighter color, shaded on each side, at the ring joints with a darker color. Sub-dorsal line light sulphur-yellow, with a band of dirty brownish-yellow underneath. Along the stigmatal region is a wavy line of a dark shade, with flesh-colored markings underneath it; but the distinguishing feature is a row of black velvety marks along each side of the back, on all but the thoracic segments, and bearing a general resemblance, looking from anus to head, to the letter W. Ventral region greenish-gray; prolegs of same color; thoracic legs brown-black. Head black, with a white line in front resembling an inverted Y, and white at sides. The thoracic segments frequently have a greenish hue.

Chrysalis.—Of the normal form and color, with but one rather long thorn at extremity.

THE GREASY CUT-WORM.—Pl. 1, Figs. 8, 9 and 10.

(Larva of the Lance Rustic, *Agrotis telifera*, Harris.)

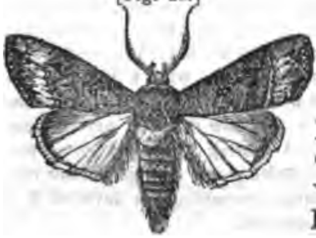
In the *Prairie Farmer* for June 22, 1867, I described a large cut-worm under the name of the "Black cut-worm." I have since ascertained that it is quite variable in its coloration, some specimens being lighter, and the markings much more distinct than in others, and have therefore concluded to give it the above appellation. This worm is usually of a deep leaden-brown inclining to black, though some specimens are of a greasy glancous color, with a dark flesh-colored back. It is always more or less distinctly marked as in Figure 9, of Plate 1, while the head, when retracted within the first segment, presents the appearance of Figure 10 on the same plate, this figure being enlarged beyond the natural size. It is probably the most common cut-worm in the country, for the moth is frequently caught in our rooms in all parts of the United States. Though it has not, so far as I am aware, the climbing habit of the preceding species, it has a most emphatic and pernicious *cutting* habit.

Mr. Jordan, of the St. Louis nursery, had transplanted a great number of tomato plants last spring, but lost well-nigh every one of them by this pernicious worm. It cut off large plants that were over six inches in height, generally at about an inch above ground, and thus effectually destroyed them. After severing one plant, the same worm would travel to others, and thus in a single night, from three to four plants would be ruined by a single individual. Along the Clayton road, to the west of St. Louis, most of the corn had to be replanted on account of its attacks. On the 22d of May I examined several fields, and was surprised to find these worms present at almost every hill, most of them being two-thirds grown. The land is clayey, and was at that time quite hard, and each worm had a smooth burrow in which it lay hidden, and to the bottom of which it could generally be traced. I subsequently learned that a large tobacco field belonging to Mr. F. R. Allen, of Allenton, had been entirely ruined soon after it was planted, by this same worm, and I found it in my own garden cutting off cypress vines. Indeed, nothing seems to come amiss to its voracious appetite, for in confinement it devoured with equal relish, apple and grape leaves.

This species comes to its growth in this latitude by the end of May, though the moth does not make its appearance till the month of July.

The moth is known as the Lance Rustic (*Agrotis telifera*, Harris), and is represented in the annexed Figure 28, and still more correctly at Plate 1, Figure 3. The upper wings are light-brown shaded with dark-brown, and the under wings are pearly white, with a gray shade around the edges; but the characteristic feature, from which it takes its name, is a dark-brown lance-shaped mark running outwardly from the kidney-spot.

[Fig. 28.]



AGROTIS TELIFERA, Harris—*Larva*—(Pl. 1, Fig. 9)—Length 1.50@1.60 inches when crawling. General color above, dull dark leaden-brown. A faint trace of a dirty yellow-white line along dorsum. Subdorsal line more distinct, and between it and stigmata two other indistinct pale lines. Eight black shiny piliferous spots on each segment; two near subdorsal line, the smaller a little above anteriorly; the larger just below it, a little back of the middle of the segment, with the line appearing especially light above it. The other two are placed each side of stigmata, the one anteriorly a little above, the other just behind, in the same line with them, and having a white shade above it. Head light brown, with a dark brown spot each side and dark brown above, leaving the inverted Y mark in the middle, light brown, and having much the appearance of a goblet, as one looks from tail to head. Cervical shield dark brown, except a stripe above and each side. Sparse short white bristles laterally and posteriorly. Venter and pro-legs of a glaucous glassy color. Thoracic legs light brown.

It varies considerably in depth of shading, and some of the lighter specimens have the lateral stripes quite distinct, and the dorsum is frequently of a dull carneous with a darker shade, divided by a fine line of a lighter color, along the middle. There is frequently a third piliferous spot near the stigmata.

Chrysalis.—Average length 0.54 of an inch, very pale shiny yellowish-brown, with two large dark brown eye-spots. Stigmata and anterior edge of four largest abdominal segments on the back, also dark brown and shagreened. Two minute thorns at extremity.

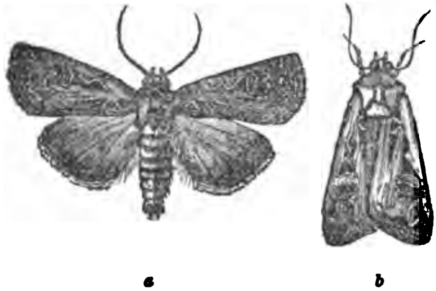
Imago.—As Harris's description, as given in his "Injurious Insects," is not very complete, I subjoin a more detailed one: Average expanse 1.60 inches. Color of fore-wings brownish-gray, verging into a very dark brown, with a bluish tint at the costa, for nearly one-third the width of the wing. Middle area somewhat darker than basal and limbal, the latter being especially light at the apex, and between transverse posterior and subterminal lines; having distinct spots on the nerves, and two distinct sagittate marks. Ordinary spots dark, with a very fine dark brown annulation, especially distinct around the dentiform. Reniform spot of normal shape. Orbicular nearly oval, and generally elongated into a point posteriorly. Distinguishing feature a dark brown lance-shaped mark, running from posterior portion of reniform spot. Transverse anterior geminate, dark. T. posterior geminate, dark, projected and arcuated above. Subterminal line light, irregular and festooned. Median band distinct. Subterminal space dark, especially where broadest, at nerves 5, 6 and 7. Margins dark brown, with a lighter inward, angular rim between each nerve. Costa with usual spots. Fringes light, with a central line, the inner half having dark square spots on the nerves. Hind wings pearly white, semi-transparent, margined behind and veined with dusky gray. Fringes even whiter, with a faint darker line. Under side of fore wings pearly-gray; hind wings concolorous, but with a broad band of speckled gray on the anterior margin. Legs dark, with light spots at joints. Head often rust-brown. Antennæ brownish. Prothorax very clearly defined, and of a rich dark brown at margins. Thorax and body light lilaceous-gray, the tegulæ being rimmed with flesh color.

THE WESTERN STRIPED CUT-WORM.

(Larva of the Gothic Dart, *Agrotis subgothica*, Haworth).

Dr. Fitch, in his Second Report, on noxious insects of the State of New York, describes a cut-worm by the name of the "Striped cut-worm," (p. 313), In his 9th Report, (pp. 245–8), this worm was very fully re-described, together with the moth which it produces. This worm seems to have done great injury to the corn crop in the East, and the moth is a variety of the Corn Rustic (*Agrotis nigricans*, Linn,) which Dr. Fitch named *maizi*. It will be referred to on page 87. From worms, found in an orchard, and answering entirely to that description. I have bred numerous specimens of one of our most common owlet moths, namely, the Gothic Dart (*Agrotis subgothica*, Haworth.) As the worms are so similar in appearance, I have called the one under consideration, the "Western Striped Cut-worm," as no other name would better characterize it, though it is evidently as common in the East as it is in the West. Its general appearance is not greatly unlike that of the "Greasy Cut-worm" already described, but its average size is but 1¼ inches. The ground color is dirty white or ash-gray and it has three broad dark lines, and two light narrow ones along the sides, and a light one, edged on each side with a dark one, along the middle of the back. This species remains longer in the ground than any of the others, and the moth does not appear till August and September. The moth is represented at Figure 29, *a*, with the wings expanded, and at *b* with the wings closed. Its markings are so conspicuous and characteristic that it suffices to say that the light parts are of grayish flesh-color, and the dark parts of a deep brown. It was first described in the year 1810 by Mr. Haworth, and is supposed to be an English insect; but as it is quite rare in England, and very common in this country, Dr. Fitch concludes, and I think rightly, that it is an American insect, the eggs or larvæ of which have accidentally been carried to England.

[Fig. 29.]



AGROTIS SUBGOTHICA, HAW.—*Larva.*—Length 1.25 inches. Ground color dirty white or ash-gray, inclining in some instances to yellowish. A whitish dorsal line edged on each side with a dark one. Three lateral dark broader stripes—the lower one broadest of all—separated by two pale ones. Quite often an indistinct glaucous white stripe under the lower broad dark one. Piliferous spots of good size. Head shiny black, or in some individuals finely speckled with white, especially at the sides; with the usual forked white line like an inverted Y. Cervical shield, or upper portion of the first segment, of the same shiny color as the head, with a white stripe in the middle, contiguous to that on the head, and another each side. Venter dull white. Legs the same, varied with smoky brown.

THE DINGY CUT-WORM—Pl. 1, Fig. 11.

(Larva of the Dart-bearing Rustic, *Agrotis jaculifera*.)

We have, in the West, another cut-worm, resembling the preceding species in almost every particular, the following being the only permanent differences: 1st, It never attains quite so large a size, 2d, it is generally darker and more dingy, and the longitudinal lines are consequently less distinct; 3d, it is generally of a more decided dull pale buff color on the back.

On the 27th of last June, I received several of these cut-worms from Mr. Horace Starkey, of Rockford, Illinois, with a statement that they were proving quite destructive in the gardens of that vicinity, but without specifying what particular plants they attacked. They entered the ground soon after being received, and by the 7th of July, had all changed to chrysalids. The chrysalis differs from most of the others, in being of a very light honey-yellow, shaded with brown, with the eyes dark brown, and two sub-quadrate spots of the same color on the wing-sheaths, just above the antennæ. It measures 0.65 of an inch in length. The moths began to issue on the 2d of September, and proved to be a species very closely allied to the preceding. Indeed the markings on the wings are almost exactly the same; but it is a smaller species, seldom expanding more than 1.25 inches and differs materially upon a strict comparison, and especially in the ground color being lighter and more silvery. It is faithfully represented at Plate 1, Figure 11. This species, as I am kindly informed by Mr. Cresson, is marked *Agrotis jaculifera* in the collection of the American Entomological Society, but without authorship; and as the name seems appropriate I have retained it.

Thus we have in this country, at least three species of cut-worms, which differ no more from one another in general appearance, than do individuals of the same species; and yet they all produce distinct moths, though it is worthy of remark that the moths produced from worms so resembling each other, viz: *Agrotis nigricans*, var *maizi*, *A. subgothica* and *A jaculifera;* have, all three of them, the space between and behind the two ordinary spots on the front wings of a dark brown color. It is possible that each of these species may have a different habit, but time, and further investigation will alone determine the point.

AGROTIS JACULIFERA—*Larva*—Length one inch. Similarly marked to that of *Agrotis subgothica,* with the colors darker and more dingy, the longitudinal lines less conspicuous, and the dorsum of a more decided pale buff color.

Chrysalis—Length 0.65–0.70. Color honey-yellow with dull brown shadings, and dark-brown eyes, but characterized especially by two subquadrate dark spots on the wing-sheaths just above antennæ.

Perfect insect—Much resembling *A, subgothica*, Haw., being marked as at Plate 1, Figure 11. It differs from that species in the following respects: The average expanse is but 1.30. The whole ground-color is colder (to use the language of the artist), i. e., of a whiter gray, with less of the buff color. The costa is darker, and the light costal band narrower; the posterior median nerve is almost white and very distinct to the lower part of the reniform spot; nerves 3, 4 and 5 are well relieved by light margins; the streak running between nerves 2 and 3 is very distinct and less diffuse; the terminal space is darker, and the inner margin only broken by nerves 4 and 5; there are no sagittate spots, while the posterior margin is very clearly defined by a black line bounded outwardly by a light one.

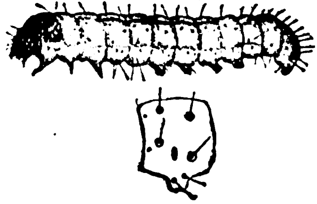
Described from three bred specimens.

THE GLASSY CUT-WORM.

(Larva of the Devastating Dart, *Agrotis devastator*, Brace.)

In the year 1819, in a short article upon the cut-worm, published in the first volume of Silliman's Journal, p. 157, Mr. Brace, of Litchfield, Connecticut, gave an account of this moth, which he bred from pupæ that were found a few inches under the ground, in a cabbage patch. He did not describe the worm which produced the pupæ, as he evidently supposed there was but one kind of cut-worm in existence. Consequently, up to the present day the larva of this common Devastating Dart moth has been unknown. It was my good fortune to breed this moth from the larva state. The cut-worm from which it was produced, was found on the 12th of May under a wild endive plant, upon the leaves of which it had evidently been feeding. It was but half grown, and, being placed in a jar half filled with earth, that contained growing grass, it burrowed into the earth and after once casting its skin, fed entirely

[Fig. 30.]



on the roots of the grass, though other food was thrown into the jar. On the 7th of June it measured 1.80 inches when crawling, and on the 19th of the same month had changed to a chrysalis from which the moth emerged on the 7th of July. The worm is represented at Figure 30, and may at once be distinguished from all others of its tribe, that are known, by its translucent glassy green body, in contrast with a very distinct hard, polished, dark-brown shield on the first segment, and a bright venetian-red head. The usual spots on the body are quite distinct, and placed in the positions given at the lower outline of Figure 30, which represents the side of one of the middle segments.

The moth bears a close general resemblance to the Cochran Rustic already described, the ground color being the same. It differs in its larger size; in the wavy transverse lines being more equidistant; in the spots in the shape of arrow heads, which emanate from the inside of the last or outer line, being darker and more distinct; and in the outer edge of the large kidney-shaped spot being almost always quite white. Entomologically, it differs still more essentially, for though named *Agrotis devastator*, it seems to belong to the genus *Mamestra*. Here we have the converse of the facts given, in speaking of the Dingy cut-worm, for, closely as the Cochran Rustic and this Devastating Dart moth resembles each other, their larvæ are very dissimilar.

AGROTIS (MAMESTRA) DEVASTATOR, Brace—*Larva*.—Length 1.80. Color translucent glassy green, with a tinge of blue. Usually, a very deep bluish dorsal line. Four distinct piliferous spots on each segment, each with a slight annulation. Two other minute simple spots, without hairs on the anterior edge of the segment (see Fig. 30,). Head, bright Venetian-red, with black jaws, and a small black spot each side. Cervical shield, very distinct, hard, polished and of a dark brown. Caudal plate, less defined and more dusky. The body is lighter posteriorly than anteriorly and the dorsal line is most distinct along the middle segments.

Chrysalis—Quite dark mahogany brown, with the body somewhat more attenuated than is usual, and with two distinct slightly curved thorns at extremity with several other stiff bristles around them.

THE SPECKLED CUT-WORM—Pl. 1, Figs. 14, 15, 16 and 17.

(Larva of the Subjoined Hadena, *Hadena subjuncta*, Gr. & Rob.)

At two different times, I have found in a truck garden hiding in the ground, under cabbage plants, near St. Louis, a cut-worm which may be known by the above name. On one occasion, I also received the same worm from my friend, Mr. A. Bolter, of Chicago, who found it in Wisconsin. It is at once distinguished from all others that are known by several characteristics, but more especially by being speckled as with pepper and salt, when viewed with a pocket lens, the ground color being flesh-gray, with a tinge of rust color in the middle of each segment. The head is marked as in Figure 15, each segment on the back as in Figure 16, and the extremity as in Figure 17 of Plate 1—these figures being enlarged the better to show the markings.

Those which I bred, fed voraciously on cabbage leaves during the night and lay concealed and motionless during the day. Before changing to chrysalids, they became of a uniform pale dirty yellow, with the markings almost entirely obliterated. The chrysalis is of the usual form and the moths appeared between the 2d and 8th of August. The kind of moth that was produced from these worms is faithfully represented at Plate 1, Figure 14, the front wings being marked as in the figure, with grayish-brown and black, and having a dull flesh-colored shade. It differs essentially from all those that I have hitherto described, and belongs to a different genus (*Hadena*). It was named *Hadena subjuncta* by Guenée, in his MS. and this name has been retained by Messrs. Grote & Robinson, in their description of it published in the Transactions of the American Entomological Society, Volume II, pp. 198-9, which will be found below.

HADENA SUBJUNCTA, Gr. & Rob.—*Larva.*—Average length 1.60 inches. Color carneous-gray, inclining to ferruginous in the middle of each segment. Minutely speckled as with pepper and salt. A lateral stigmatal stripe, somewhat lighter than the rest of the body. An interrupted dorsal and subdorsal white line, these lines being quite distinct on the posterior half and indistinct on the anterior half of each segment. Two distinct spots anteriorly on the dorsum of each segment; the other spots obsolete. Head light shiny brown, with two outwardly diverging darker marks. Segment 1, with the three longitudinal white lines and a white anterior edge, shaded on the inside with dark brown. Anal segment with a white transverse line, somewhat in the shape of a drawn-out W, and with a deep shade above it. Venter glaucous. Legs of the same color.

Chrysalis.—Of a deep brown color, rather short and thick, and with two bristles at extremity.

Imago—(Pl. 1, fig. 14). Length 0.65; expanse 1.50 ♂ ♀.—Antennæ simple, finely and shortly ciliate beneath. Carneous brown. Head with a dark frontal line. Prothoracic pieces with a very distinct and deep brown line. Abdomen crested above at base, with a spreading anal tuft in the male. Fore wings, above, blackish brown shaded with carneous. A longitudinal deep brown basal ray, shaded inferiorly, extending outwardly and narrowly to the transverse anterior line. Above this ray, the base is tinged with carneous, and the basal line is indicated by a dark geminate costal streak. Transverse anterior line geminate, the outer line the darker, roundedly and evenly interspaceally waved, nearly prependicular. Ordinary spots very large, distinctly limited. The median space is wide superiorly, but is constricted below the median nervure; a longitudinal deep brown streak runs along the submedian fold and connects the two median lines at their point of greatest contiguity. This streak becomes the lower margin of the claviform spot which abutts from the transverse anterior line, and whose upper margin is seen in a very distinct deep brown line running outwardly and downwardly obliquely from the median nervure. Above the claviform is the large obicular, pale, with a distinct annulus. The reniform is wide, of the ordinary shape, with an indistinct central shade and the distinct annulus is often obsolete outwardly. Beyond the reniform, the wing is shaded with carneous to the subterminal line, this shade spreading inferiorly. A diffuse and faint blackish median shade runs from the costa downward between the ordinary spots and is discontinued below median nervure. The transverse posterior line is incepted above the reniform, runs outwardly straightly along the costal region, thence downwardly over the nervules, bending inwardly beneath the reniform spot. It is geminate, faint, the lines enclosing a paler space and interspaceally lunulate. Subterminal line pale, preceded by a dark shade, forming the usual M-shaped mark at the middle, the points of the M attaining the external margin. The dark shading is sometimes tinged with olivaceous before the internal angle as is the inferior shading of the longitudinal streak connecting the median lines. The terminal space is blackish brown and black interspaceal marks precede the terminal line. The fringes are uneven; the external margin of the wing retires inwardly before internal angle.

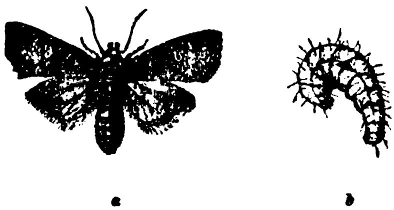
Hind wings smoky blackish, paler towards the base, without discernable discal mark or lines. Under surface pale. The wings terminally and along costal edges are covered with powdery squamation with intermixed dark scales bringing the nervules into relief. The fore wings show three ante-apical white dots and the white subterminal shade line emanates from a fourth and larger dot just before the apex, these latter at times hardly discernable. Faint discal dots; sometimes traces of dark median lines can be seen on both wings.

THE SMALL WHITE BRISTLY CUT-WORM.

(Larva of the Figure 8 Minor, *Celæna renigera*, Stephens).

During the month of August in North Illinois, a small dirty-white cut-worm may frequently be found in flower gardens, where it doubtless feeds for the most part on the roots of various flowers. This worm is represented at Figure 31 *b*. It never gets to be more than ¾ of an inch in length, and is covered with distinct, stiff yellow bristles, and may be popularly known by the above name. During the fore part of August it descends deeper into the ground, and soon changes to a very bright shiny, mahogany brown chrysalis, from which in about three weeks afterwards, the moth emerges.

[Fig. 31.]



This moth is represented (as well as a wood cut can represent it) at Figure 31 *a*. It is quite prettily marked, the fore-wings being brown, variegated with lilac-gray and moss-green, with a deep brown spot about the middle and a silvery annulation around the kidney-shaped spot. It is the *Celæna renigera* of Stephens of which *C. herbimacula*, Guénée is a synonym, and as it should have a popular name, it may be called the "Figure 8 Minor," in allusion to the silvery edge of the kidney-spot which almost always reminds one of the figure 8. In the genus *Celæna* the wings are entire, broad and rounded, and there is a conspicuous tuft on the crown of the head. The species may at once be distinguished from those of *Agrotis* and *Hadena* by their smaller size and more rounded appearance.

CELÆNA RENIGERA, Stephens.—*Larva*.—Length 0.75 of an inch.—Color dusky salmon-yellow, the dusky dirty appearance, caused by innumerable dark specks all over it. Largest at the four middle segments and tapering thence each way. A dark lateral stripe, distinct on the middle segments, indistinct at both ends. Distinguishing feature, very visible stiff yellowish bristles, proceeding from the usual spots which are small. A dorsal line is indicated under the glass by two indistinct thin lines at the joints of the segments.

Chrysalis.—Length 0.56 of an inch; concise; of a bright polished mahogany brown, with dark eyes and very slightly punctured on the anterior portion of the abdominal segments.

Imago.—Expanse 1.10 inches. Fore wings brownish-gray, with a more or less determined carneous or lilaceous hue. Orbicular spot sub-obsolete; sometimes entirely obsolete. Reniform spot of normal shape, moss-green, with a snow-white annulation, indistinct above; broad and distinct below. Ordinary lines lighter. Basal half-line distinct only on costa, and below posterior median nerve. Transverse anterior single, obliquing but slightly, and bordered posteriorly with a very thin broken darker line; it is moss-green in the middle, and there is a green shade running from it to the basal half-line, dividing the sub-basal space. Opposite this green in the median space, is a dark subquadrate almost black spot, and between the stigma the wings are also quite dark. Transverse posterior single, posteriorly oblique a little more than ⅓ of breadth of wing, then parallel with posterior margin, forming at the second nerve a roundish spot which extends to the anal angle, and is dark below and moss-green above. Subterminal line usually very indistinct—merely indicated by a few dots. A median arcuated band is perceptible, being broader and darker between the stigma and interrupted in the middle by lower portion of reniform spot. A minute light spot on each vein at posterior margin. Costa with a light spot at terminus of sub-basal line, of transverse anterior, and above reniform spots—dark each side of these and at terminus of median band; concolorous with wing at subterminal space, having four very minute light spots, one at ends of subterminal and transverse posterior lines, and two between them. Fringes concolorous with the wing, having a very fine darker edge.

Hind wings carneous-gray at base and interiorly—darker anteriorly and posteriorly and especially at posterior margin. Nerves and lunule rather dark. Fringes same color as interior of wing, with a darker central line.

Under surface of fore wings brownish-gray, the fringes and transverse posterior darker and the spots faintly marked at costa. Under surface of hind wings of same color above, lighter below, with the lunule dark and the arcuated band distinct.

Legs dark-gray with light spots at joints; palpi same color. Head, prothorax and thorax not quite so purplish as wings. Prothorax with a light margin at junction of wings—the tegulæ also with a light spot. Body same color as hind wings above, darker below. Feelers same.

OTHER CUT-WORMS.

Besides the ten distinct cut-worms, whose transformations I have just recorded, there are two others, which Dr. Fitch has described in all their stages. The one is the "STRIPED" or "CORN CUT WORM" as he calls it, which proves very injurious to corn, by cutting it off about an inch *above* ground. This worm produces a dusky-gray moth (*Agrotis nigricans*, Linn.—var. *maizi*), which is distinguished principally by two coal black spots, one nearly square, placed outside of the centre of the fore wing, and the other nearly triangular, a little forward of it, a roundish nearly white spot separating them. The other which Dr. Fitch has called the "YELLOW-HEADED CUT-WORM," is of a shining livid color, with a yellowish or chestnut-colored head and a horny spot of the same color on the top of the first and last rings. It is a large species and produces the Amputating Brocade moth (*Hadena amputatrix*, Fitch), which is figured on page 450, of Harris' work. This moth is distinguished by its Spanish-brown upper wings, marked with a large pale kidney-shaped spot, and a broad wavy blue-gray band near the end. The worm was found by Dr. Fitch to be even more injurious to corn than the striped species, since it severs the plant *below* ground; while it also combines the habit of climbing trees during the night, according to Harris.

Thus, we are now acquainted with the natural history of just one dozen of these cut-worms, while there is fully another dozen whose habits and history yet remain to be studied. Of one of these, especial- soon to give the complete history. Meanwhile, I will give a brief account of the worm itself, which may be known as

THE WHEAT CUT-WORM.

On the 10th of October, 1868, I received from Mr. F. R. Allen, of Allenton, Missouri, the following communication:

"Enclosed I send you some specimens of a worm that seems to be preying upon the recently sown wheat. My neighbor, Mr. George W. Moore, informed me a day or two ago, that a worm was eating all his wheat that he had lately sown in oats ground. I went to see what it was yesterday, and as I am not entomologist enough to tell, I refer them to you. Mr. Moore has learned within a day or two, that this same insect is now generally preying on the wheat in Franklin county, that is sown on oats stubble. What is remarkable they do not yet trouble the wheat in the same field sown on wheat stubble. Nor do they seem to feed on the volunteer oats in the same field, but entirely destroy the young wheat."

Subsequently, upon visiting Allenton, Eureka, and other places in St. Louis county, I ascertained from L. D. Votaw and others, that this worm had been known to attack wheat in the fall for many years back. They come to their growth the latter part of October, descend into the earth and pass the winter in the chrysalis state. The only manner in which I can account for their appearing only on that wheat which was sown on oats stubble, is by supposing that the scattering oats that were left after harvest had sprouted before the wheat, and had thus attracted the parent moths. On this supposition the worms had hatched and fed awhile, before the ground was ploughed, and planted to fall wheat, and this seems the more likely, since the worms were full-grown, almost as soon as the wheat appeared above ground. If this supposition be correct, the attacks of this worm can be effectually prevented by ploughing the land early and keeping the ground clear of all vegetation until the wheat is planted. No other rational explanation can be given, for I found by experiment that they would devour with equal relish the young plants of both oats, wheat, and a variety of grasses.

In the *Canada Farmer* for April 15, 1867, an account was given of the ravages of "cut-worms" on Spring wheat, in the county of Huron. Judging from the account however, the worm referred to, was the common "White grub;" but if it be the same as that spoken of above, the fact can be ascertained by the description which I subjoin herewith.

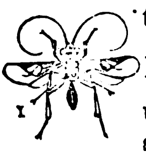
THE WHEAT CUT-WORM.—A dark pitchy black cut-worm, the characteristic mark being, a very distinct pale buff or flesh-colored stigmatal band. Dorsum generally of a brownish shade, the dorsal line of the same color, with a more or less distinct dingy shade each side of it. The subdorsal region is always the darkest part of the worm, being of a pitchy brown; but edged above, at junction of dorsum, with a fine light buff-colored line, and generally variegated in the middle, with very minute light colored irrorations. Eight sealing-wax-like black elevated piliferous spots on each segment, those on dorsum usually having a white base outwardly. Greatest width at segments 10 and 11, the spots upon them being also the largest. Head, deep polished brown, with the usual inverted Y-shaped white mark, and some white spots at sides; also with white lips, and perfectly white palpi. Cervical shield, of same color as dorsum, but polished, and with the dorsal and sub-dorsal white lines quite distinct upon it. Caudal plate with a bright cream-colored longitudinal dash (generally constricted in the middle) between two black spots. Venter and legs glassy glaucous. The young worm is almost uniformly pitchy black, with the light stigmatal band always visible however. Indeed this band is always constant no matter how much the worms vary in depth of ground-color.

There are various other naked caterpillars which are frequently found upon the ground near vegetation of various kinds. Thus during the months of July and August, a species with the back of each segment very characteristically marked as represented at Plate 1, Figure 12, may often be found. It seems to feed on a variety of herbs, and produces a prettily variegated moth known as *Prodenia commelinæ*, Guénée; but though this and other species may have the cutting habit, they have never attracted notice so far, and I shall pass them over and proceed at once to suggest the proper preventives and

REMEDIES AGAINST CUT WORMS.

Natural Remedies.—These cut-worms, like all other vegetable-feeding insects, have numerous insect enemies which are continually on the alert for them, and materially assist us in keeping them in due bounds. Of those that are parasitic internally may be mentioned the minute four-winged flies belonging to the genus *Microgaster*. One of these which is parasitic on the Army-worm (the *M. militaris* of Walsh) is represented at Figure 32, and it bears a strong resemblance to an undescribed species which I have often bred from a cut-worm, described in the *Prairie Farmer* as the "Pale cut-worm." The female fly punctures the tender skin of the worm and deposits great numbers of eggs in the body. These eggs produce maggots which live upon the fatty parts of the worm, and slowly but surely produce the death of their victim. When full grown they pierce the skin of the worm and spin their white silken cocoons, in company, on his body, and in due time issue forth as flies.

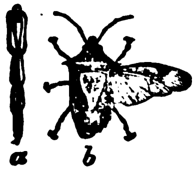
[Fig. 32.]



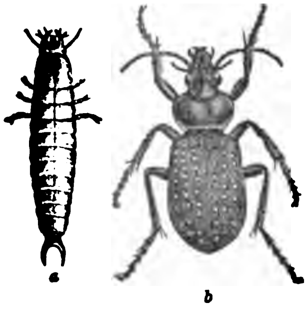
There is also a large yellowish-brown four-winged Ichneumon fly (the *Paniscus geminatus* of Say), which I have bred from cut worms. The parent fly deposits a single egg within the body of a worm, but the maggot hatching from this egg does not cause the worm to die, till after the latter has entered the earth to become a chrysalis. At this point the worm suddenly succumbs and the maggot spins a tough, black, smooth cocoon, and where we expected to see a moth rise to day-light, we behold in time this Ichneumon fly.

Among the cannibals, that bodily devour these worms, may be mentioned the Spined Soldier-bug, already referred to on page 77, note, and whose likeness I produce at Figure 33. This fellow is such a thorough cannibal, and so serviceable to man, that his portrait cannot be too well graven on the mind. It is not unlikely, also, that most of the ground beetles that are figured in a future chapter on the 10-lined Potato beetle, prey upon cut-worms; and the Homely Geopinus referred to in the note on page 77 has been found to do so, but by far the most efficient insect in slaying these worms is the larva of the Fiery Ground beetle (*Calosoma calidum*, Fabr.), which I represent at Figure 34 *a*, by the side of its parent Figure 34 *b*. This larva has very appropriately been called the Cut-worm lion, by Dr. Shimer of Mt. Carroll, Illinois, who gives the following account of its mode of transformation to the perfect beetle: "The fat, full grown larva of *Calosoma calidum* chooses a hard piece of ground, as a wagon road in the field, where it bores into to pass the pupa state. I have seen them many hours in boring a few inches. These

[Fig. 33.]



[Fig. 34.]



fierce insects often wage terrible battles when they encounter each other, and they will eat each other as readily as cut-worms, as I found whenever I put more than one of them into my collecting box. He that would breed these insects to the perfect state, must pack the dirt in his breeding box as hard as a wagon road, or he will fail, as I always did before I saw their operations in the field. In using moderately compact earth, the larva digs it over and over, endeavoring to find a suitably dense place, works up the dirt into balls, until its feet are clogged up with earth and juices from its mouth, and it sinks exhausted and dies. In a few days after it enters the ground, the beautiful spotted, perfect beetle appears, and, strangely, the smell of the beetle is peculiar and entirely different from the larva."

This Cut-worm lion has quite a formidable appearance, and is exceedingly agile. It is flattened, of a black color, with six legs upon the breast, and a pair of sharp hook-like jaws projecting in front of its head. It pursues the worms in their retreats under the ground, and seizes them wherever it comes in contact with them. Sometimes a young Cut-worm lion will seize a worm twice as large as itself, and will cling with bull dog tenacity to its prey, through all its throes, its writhings and twistings, till at last the worm succumbs, exhausted, and the victor bites two or three holes through its skin and proceeds to suck out its juices.

Some kinds of spiders are also known to prey on cut-worms, and these unwisely unpopular little animals should always be cherished and protected. Poultry is also quite efficient in destroying them, and chickens are better than any other kind. I cannot too strongly urge their claims as cut-worm destroyers, than by giving the statement of Mr. Cochran, to-wit: that he believed he could not possibly have coped with the worms without the aid of a large brood of chickens which he procured for that purpose.

ARTIFICIAL REMEDIES.—The climbing cut-worms are easily headed off by a little vigilance. From the orchard planted upon light, warm soils they can be driven away entirely by claying the ground about the trees; a wheelbarrow full is well nigh enough for each tree when spread around its base and as far as the limbs extend. This is the most thorough and lasting. A small strip of tin, three inches wide, carefully secured around the body of the tree, will effectually prevent their ascension; if the tin is old and rusty it will require to be a little wider. Each night, after the swelling of the bud, an hour or two after midnight a slight jar of the tree will bring every one on it down, when they can be caught in a spread sheet and destroyed. This will have to be followed up till the bud has unfolded into the leaf, after which there is no longer anything to be apprehended from the worm. The reasons why the clay is so efficient, are two-fold: 1st—The worms seem to have an instinctive dislike to crawling over it. 2nd—In dropping from the tree on to the hard surface they are frequently disabled, and whether disabled or not, they cannot immediately burrow into it as in sand, and they are all the more exposed to their numerous midnight enemies which are ever watching for them.

For the common field cut-worms, I am convinced that there is no better remedy, as a rule, than hunting and killing them. It is generally believed that ashes and lime used about plants will keep off cut-worms, and I might fill pages with recorded experiments, going to prove the good effects of these substances. The experimenters generally forget, however, that there is a period in the life of these worms when they of themselves go down in the earth and disappear, and anything applied just before this happens is sure to be heralded forth as a perfect remedy. Experiments show, however, that when placed in a box with separate quantities of ashes, lime, salt and mold, they will burrow and hide in all of them, but especially in the ashes and mold. Soot seems to be more obnoxious to them, and, although I have not yet had an opportunity to give it a thorough test, I do not wish to discourage its trial. Fall plowing, to be efficacious, must be done very late in the fall, when the worms are numbed with cold, and then I think it is of doubtful utility further than it exposes them to the attacks of enemies, including birds.

In a case like that, communicated by Mr. Allen, it would pay to dig a narrow ditch around the part of the field infested, the outward side to be made smooth and slanting under; for these worms cannot crawl up a perpendicular bank of earth. On the same principle, many an one may be entrapped by making smooth holes with a stick around hills of corn or other plants, and on going over the same ground the next day, those that are thus entrapped can be crushed by the end of the same stick. In corn fields that have been subject to the attacks of cut-worms, it is well to plant so much seed as will enable them to glut their appetites without taking all the stalks in the hill, and in this light the following lines contain a deal of wisdom:

> "One for the black-bird and one for the crow,
> Two for the cut-worm and three to grow."

INSECTS INFESTING THE POTATO.

As the potato forms one of our leading articles of diet, and is universally cultivated, an accurate knowledge of the insects which attack it, is of the utmost importance. A very full account of them was given in the October and November numbers of the AMERICAN ENTOMOLOGIST, and since the editions of those two numbers are entirely exhausted, I cannot do better than to transfer it, for the most part, to the pages of this report, with such additions and alterations as I have since found necessary.

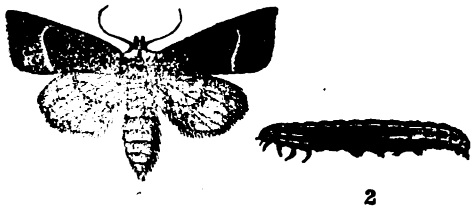
We often see paragraphs in the papers, stating that "THE Potato Bug" has been very abundant and destructive in such a month and at such and such a place. Accompanying these statements, remarks are frequently added, that "THE Potato Bug" is preyed upon by such and such insects, so that we may soon expect to see it swept from off the face of the earth; and that, even if this desirable event should not take place, "THE Potato Bug" may be checked and controlled by such and such remedies.

Do the worthy men, who indite these notable paragraphs, ever consider for one moment, that there are no less than eleven distinct species of bugs, preying upon the potato plant within the limits of the United States? That many of these eleven species are confined within certain geographical limits? That the habits and history of several of them differ as widely as those of a hog and a horse? That some attack the potato both in the larva state and in the perfect or winged state; others in the perfect or winged state alone; and others again in the larva state alone? That in the case of eight of these insects there is but one single brood every year, while of the remaining three there are every year from two to three broods, each of them generated by females belonging to the preceding brood? That nine of the eleven feed externally upon the leaves and tenderer stems of the potato, while two of them burrow, like a borer, exclusively in the larger stalks? Finally, that almost every one of these eleven species has its peculiar insect enemies; and that a mode of attack, which will prove very successful against one, two or three of them, will often turn out to be utterly worthless, when employed against the remainder?

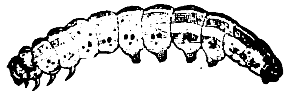
THE STALK-BORER—*Gortyna nitela*, Guénée.

(Lepidoptera, Noctuidæ.)

[Fig. 35.]



[Fig. 36.]



This larva (Fig. 35 2,) is of a livid hue when young, with light stripes along the body, as shown in the figure. When full grown it generally becomes lighter, with the longitudinal lines broader, and at this time it more frequently resembles Figure 36. It commonly burrows in large stalks of the potato; but is not peculiar to that plant, as it occurs also in the stalks of the tomato, and in those of the dahlia and aster and other garden flowers. I have likewise found it boring through the cob of growing Indian corn, and strangely confining itself to that portion of the ear: though it is likewise found occasionally in the stem of that plant. By way of compensation, it is particularly partial to the stem of the common cocklebur (*Xanthium strumarium*); and if it would only confine itself to such noxious weeds as this, it might be considered as a friend instead of an enemy. In 1868 it was more numerous than usual, and was particularly abundant along the Iron Mountain and Pacific roads.

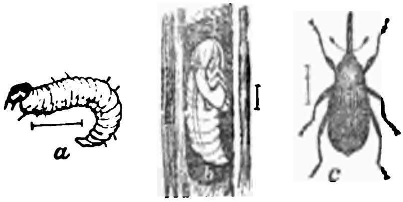
Never having found this worm earlier than June and July, nor obtained the moth from the very earliest matured ones, till the latter part of August and fore part of September, this insect must necessarily be single brooded, the egg requiring longer to hatch, and the larva longer to develop than of many other moths. Leaving the stalk in which they have burrowed the latter part of July, they descend a litte below the surface of the ground and in three days become chrysalids. These are of the normal form, with two fine bristles at the extremity of the body, usually closed so as to form a point, but readily opened V-shaped at the will of the insect, as with hundreds of others of the same class. I have had the moths issue as early as the 30th of August and as late as the 26th of September, and in one instance it emerged during a freezing night, being quite dull and numb at the time, thus showing beyond a doubt that the moths hybernate in a state of torpor, and then deposit their eggs, singly, on the plant destined for the worm, during the months of April and May. This moth (Fig, 35, 2) is of a mouse gray color with the fore wings finely sprinkled with Naples-yellow and having a very faint lilac-colored hue; but distinguished mainly by an arcuated pale line running across their outer third.

REMEDY—*Prevention.*—The careful florist, by an occasional close inspection of his plants about the beginning of July, may detect the point at which the borer entered, which is generally quite a distance from the ground, and can then cut him out without injury to the plant. As this is not feasible in a large potato field, care should be taken to prevent his attacks another year as far as it is possible to do so, by hunting for him wherever a vine is seen to suddenly wilt.

THE POTATO STALK-WEEVIL—*Baridius trinotatus*, Say.

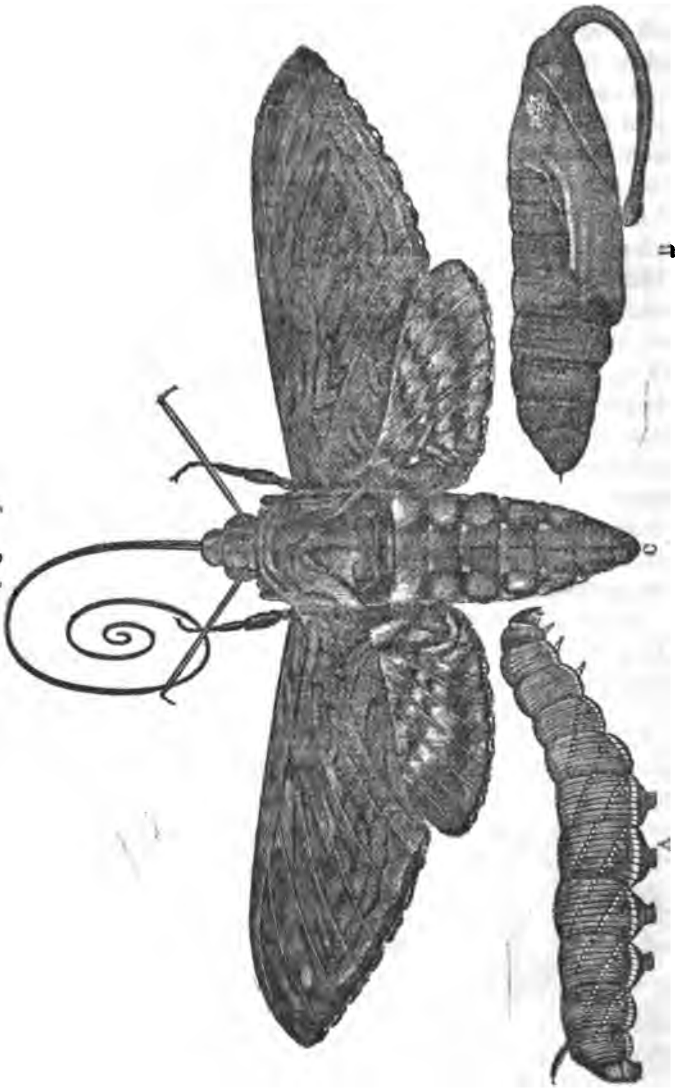
(Coleoptera, Curculionidæ.)

[Fig. 37.]



This insect is more particularly a Southern species, occurring abundantly in the Middle States, but, according to Dr. Harris, being totally unknown in New England. I found it in our own State last summer, equally as abundant as the preceding species. Indeed, some patches were utterly ruined by it, the vines appearing as if scalded. The beetle (Fig 37 *c*) is of a bluish or ash-gray color, distinguished, as its name implies, by having three shiny black impressed spots at the lower edge of the thorax. The female deposits a single egg in an oblong slit about one-eighth inch long, which she has previously formed with her beak in the stalk of the potato. The larva subsequently hatches out, and bores into the heart of the stalk, always, proceeding downwards towards the root. When

[Fig. 38.]



full grown, it is a little over one-fourth inch long (Fig. 37, *a*), and is a soft whitish, legless grub, with a scaly head. Hence it can always be readily distinguished from the larva of the Stalk-borer, which has invariably sixteen legs, no matter how small it may be. Unlike this last insect, it becomes a pupa (Fig. 37, *b*) within the potato stalk which it inhabits; and it comes out in the beetle state about the last of August or the beginning of September. The stalk inhabited by the larva almost always wilts and dies, and this wilting is first noticed in the latitude of St Louis, about the first of July, So far as is at present known it attacks no other plant but the potato, and the perfect beetle, like many other snout-beetles, must of course live through the winter to reproduce its species in the following spring.

REMEDY.—Same as with the foregoing species. Burn all the vines which wilt from its attacks—roots and all, for it almost always works below ground. The Stalk-borer must be *searched* for, if one will be sure of killing him as he *leaves* the stalk to transform; but as this Stalk-weevil transforms within the vine, one may be pretty sure of destroying it by burning the vines when they first wilt.

THE POTATO OR TOMATO-WORM—*Sphinx 5-maculata*, Haw.

(Lepidoptera, Sphingidæ.)

This well known insect, the larva of which is illustrated on the opposite page (Fig. 38, A), is usually called the Potato-worm, but it is far commoner on the closely allied tomato, the foliage of which it often clears off very completely in particular spots in a single night. Many persons are afraid to handle this worm, from an absurd idea that it has the power of stinging with the horn on its tail. But this is a vulgar error and the worm is totally incapable of doing any direct harm to man, either with the conspicuous horn on its tail, or with any hidden weapon that it may have concealed about its person. In fact, this dreadful looking horn is not peculiar to the Potato-worm, but is met with in almost all the larvæ of the large and beautiful group to which it belongs (*Sphinx* family.) It seems to have no special use, but, like the bunch of hair on the breast of the turkey cock, to be a mere ornamental appendage.

When full-fed, which is usually about the last of August, the Potato worm burrows under ground and shortly afterwards transforms into the pupa state (Fig. 38, B). The pupa is often dug up in the spring from ground where tomatoes or potatoes were grown in the preceding season; and most persons that meet with it suppose that the singular, jug-handled appendage at one end of it is its *tail*. In reality, however, it is the *tongue-case*, and contains the long pliable tongue which the future moth will employ in lapping up the nectar of the flowers, before which, in the dusky gloom of some warm, balmy summer's evening, it hangs for a few moments suspended in the air, like the glorified ghost of some departed botanist.

The moth itself (Fig. 38, C) was formerly confounded with the Tobacco-worm moth (*Sphinx Carolina*, Linnæus), which indeed it very closely resembles, having the same series of orange colored spots on each side of the abdomen. The gray and black markings, however, of the wings differ perceptibly in the two species; and in the Tobacco-worm moth there is always a more or less faint white spot or dot near the centre of the front wing, which is never met with in the other species. In Connecticut and other northern States where tobacco is grown, the Potato-worm often feeds upon the leaves of the tobacco plant, the true Tobacco-worm being unknown in those latitudes. In the more southerly States, on the other hand, and in Mexico and in the West Indies, the true Potato-worm is unknown, and it is the Tobacco-worm that the tobacco growers have to fight. While in the intermediate country both species may frequently be captured on the wing in the same garden and upon the same evening. In other words, the Potato-worm is a northern species, the Tobacco-worm a southern species; but on the confines of the two districts exclusively inhabited by each, they intermingle in varying proportions, according to the latitude.

REMEDIES.—This insect is so large and conspicuous that the most effectual mode of destroying it is by hand-picking. In destroying the worms in this manner care should be taken to leave alone all those specimens which one finds covered with little white oval cocoons, as these are the cocoons of little parasites* which materially assist us in its subjugation.

THE STRIPED BLISTER-BEETLE—*Lytta vittata*, Fabr.

(Coleoptera Meloïdæ.)

The three insects figured and described above infest the potato plant in the larva state only, the two first of them burrowing internally in the stalk or stem, the third feeding upon its leaves externally. Of these three the first and third are moths or scaly-winged insects (order *Lepidoptera*), so called because the wings of all the insects belonging to this large group are covered with minute variously-colored scales, which, on the slightest touch, rub off and rob the wing of all its brilliant coloring. The second of the three, as well as the next four foes of the potato, which I shall notice, are all of them beetles or shelly-winged insects (order *Coleoptera*), so called because what would normally be the front wing is transformed here into a more or less hard and shelly wing-case, which, instead of being used as an organ of flight, is employed merely to protect and cover the hind wings in repose. To look at any beetle, indeed, almost any inexperienced person would suppose that it has got no wings at all; but in reality nearly all beetles have full sized wings snugly folded up under their wing-cases, and, whenever they choose it, can fly with the greatest ease. This is the case with the four following beetles which infest the potato. As these four species all agree with one another in living under ground and feeding upon various roots, during the larva state, and in emerging to attack the foliage of the potato, only when in the course of the summer they have passed into the perfect or beetle state; it will be quite unnecessary to repeat this statement under the head of each of the four. In fact, the four are so closely allied, that they all belong to the same family of beetles, the blister-beetles (*Lytta* family)—to which also the common imported Spanish-fly or blister-beetle of the druggist appertains—and all of them will raise just as good a blister as that does, and are equally poisonous when taken internally in large doses. In Missouri, these blister-beetles were more numerous and more injurious in 1868 than the dreaded Colorado Potato-beetle.

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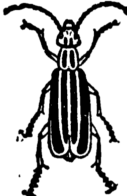
* There are two distinct parasites which attack this worm, both species being very much of a size. One issues from the worm and spins a *smooth* white silken cocoon which it fastens by one end to the skin of the worm, and in due time produces a fly which Mr. Norton informs me is an undescribed species of *Blacus*, West. (*Braconides polymorphi*). The other species forms an immense mass of loose woolly cocoons and produces an apparently undescribed species of *Microgaster*.

[Fig. 39.]



The Striped Blister-beetle (Fig. 39) is almost exclusively a southern species, occurring in particular years very abundantly on the potato vine in Central and Southern Illinois, and in our own State, though according to Dr. Harris, it is also occasionally found even in New England. In some specimens, the broad outer black stripe on the wing-cases is divided lengthways by a slender yellow line, so that instead of *two* there are *three* black stripes on each wing-case; and in the same field all the intermediate grades between the two varieties may be met with; thus proving that the four-striped individuals do not form a distinct species, as was formerly supposed by the European entomologist, Fabricius, but are mere varieties of the same species to which the six-striped individuals appertain.

The late Samuel P. Boardman, of Lincoln, Illinois, discovered that this Striped Blister-beetle, like the Colorado beetle, eats all other potato tops in preference to Peach-blows. (See *N. Y. Sem. Tribune*, July 13, 1868.) This is certainly a new fact, so far as regards the former species, though it has long been ascertained to be true of the latter, but as I shall presently show, the Margined Blister-beetle has the same tastes.

THE ASH-GRAY BLISTER-BEETLE*—*Lytta cinerea*, Fabr.

This species (Fig. 40 *a*, male) is the one commonly found in the more northerly parts of the Northern States, where it usually takes the place of the Striped Blister-beetle figured above. It is of a uniform ash-gray color; but this color is given it by the presence upon

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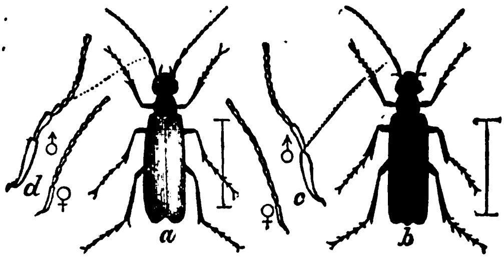
* In the male of this species, but not in the female, the first two joints of the antennæ are greatly elongated and dilated; which is also the case with the species next to be referred to. (Fig. 40 *d*, represents the male antennæ, above; that of female below.) Hence, in splitting up the extensive and unwieldy old genus (*Lytta*), these and certain allied species have been very properly placed in a genus by themselves (*Macrobasis*); while the Striped Blister-beetle and the Margined Blister-beetle, not possessing this peculiarity, are grouped together under a distinct genus (*Epicauta*). Practical men, however, who do not desire to trouble their heads with these niceties, will find it most convenient to class them all together under the old genus (*Lytta*); and this we have accordingly done.

[Fig. 40.]



its body of minute ash-gray scales or short hairs, and whenever these are rubbed off, which happens almost as readily as on the wings of a butterfly, the original black color of its hide appears. It attacks not only potato vines, but also honey-locusts, and especially the English or Windsor bean, and I found it quite abundant on the Early Snap bean at Hermann, last summer. It also attacks the foliage of the apple-tree, and likewise gnaws into the young fruit.

THE BLACK-RAT BLISTER-BEETLE—*Lytta murina*, Le Conte.

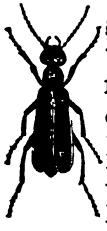
This species (Fig. 40 *b*, male) is sometimes found upon the potato in the month of July, and early in August. In 1867 it was found by Mr. D. W. Kauffman, to swarm on the potato vines near Des Moines, Iowa; but I have not yet met with it in Missouri.

THE BLACK BLISTER-BEETLE—*Lytta atrata*, Fabr.

This species is very similar in appearance to the Black-rat Blister-beetle; the latter being distinguishable from it only by having four raised lines placed lengthwise upon each wing-case and by the two first joints of the antennæ being greatly dilated and lengthened in the males as shown at Figure *c*. The Black Blister-beetle appears in August and September, and is very common on the flowers of the Golden-rod. I learned from several parties, while attending the October meeting of the Meramac Horticultural Society, at Eureka, that it had been quite numerous on the potatoes in that vicinity, and that they did much damage in some patches. The severe drouth of the summer had retarded the development of the tubers, so that this beetle attacked the vines before the latter were formed; but as a general rule, it makes its appearance too late in the season to do great damage.

THE MARGINED BLISTER-BEETLE*—*Lytta marginata*, Fabr.

[Fig. 41.]



This species (Fig. 41) may be at once recognized by its general black color, and the narrow ash-gray edging to its wing-cases. It usually feeds on certain wild plants; but I found it quite abundant on potatoes last summer, both in our own State and in Illinois. It appears not to attack the Peach Blow variety, for Mr. Wm. Brown, of Eureka. informs me that he had a patch of Quaker Russetts by the side of another patch of Peach Blows, and while the former were entirely eaten up by it, the latter were untouched.

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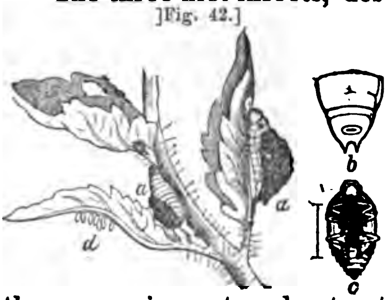
* This is the name formerly given by almost all entomologists to this species; and a most appropriate one it is, in view of the remarkable ash-gray margin of its black wing-cases (*elytra*). But of late years it has been discovered, that, as long ago as the middle of the last century, and several

Remedies.—The same remedies will apply equally to all five of the Blister-beetles that have just been described. Let it be remembered that during the heat of the day, these beetles are ready with their wings and may be driven from the vines. Thus the most practical and efficient mode of destroying them, is to drive them into a windrow of hay or straw, and kill them by setting fire to it. As they all appear rather late in the season, I should recommend the planting of early varieties, which will be more likely to escape their attacks; and especially of the Peach Blow variety, the leaves of which seem to be more distasteful to them than those of any other variety.

THE THREE-LINED LEAF-BEETLE—*Lema trilineata*, Olivier.—(Coleoptera, Chrysomelidæ.)

[Fig. 42.]



The three first insects, described and figured above as infesting the potato-plant, attack it only in the larva state. The five next, namely the five Blister-beetles, attack it exclusively in the perfect state. The three that remain to be considered attack it both in the larva and in the perfect state, but go underground to pass into the pupa state, in which state—like all other Beetles, without exception—they are quiescent, and eat nothing at all.

The larva of the Three-lined Leaf-beetle may be distinguished from all other insects that prey upon the potato by its habit of covering itself with its own excrement. In Figure 42 *a*, this larva is shown in profile, both full and half grown, covered with the soft, greenish excrementitious matter which from time to time it discharges. Figure 42 *c*, gives a somewhat magnified view of the pupa; and Figure 42 *b*, shows the last few joints of the abdomen of the larva, magnified, and viewed, not in profile, but from above. The vent of the larva, as will be seen from this last figure, is situated on the upper surface of the last joint, so that its excrement naturally falls upon its back, and by successive discharges is pushed forward towards its head, till the whole

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years before Fabricius named and described this insect as the "Margined Blister-Beetle" (*Lytta marginata*), it was named and described as the "Ash-gray Blister-beetle" (*Lytta cinerea*), by Foerster. Hence, in accordance with the inexorable "law of priority," the obedient scientific world has been called upon to adopt Foerster's name for this species; and as two species belonging to the same genus can not, of course, have the same specific name, the true Ash-gray Blister-beetle of Fabricius (*Lytta cinerea*), which is really ash-gray all over, has been re-christened by the name of "Fabricius' Blister-beetle" (*Lytta Fabricii.*) Positively, this continual chopping and changing in scientific nomenclature is getting to be an unbearable nuisance, and must be put a stop to. Otherwise one-half of the time of every entomologist, which might be much better occupied in studying out scientific *facts*, will be frittered away in studying out scientific *phrases*.

Many writers, in giving the scientific designation of an insect, neglect to add the name of the author who first described it. This practice often leads to error, uncertainty, and confusion, as the preceding example will at once show. If, for instance, we write simply "*Lytta cinerea*," how can the reader tell whether we mean the species described under that name by Foerster, or the very distinct species described under the very same name "*cinerea*" by Fabricius? Whereas, if we add the author's name, all doubts upon the subject are at once removed; and we can snap our fingers at those wearisome and interminable disputes about the priority of names and the law of priority, which take up so much space in scientific papers, while they add absolutely nothing to our knowledge of the facts recorded by the finger of God in the great book of Nature.

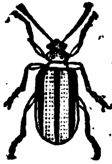
upper surface of the insect is covered with it. In other insects, which do not indulge in this singular practice, the vent is situated either at the extreme tip of the abdomen or on its lower surface.

There are several other larvæ, feeding upon other plants, which commonly wear cloaks of this strange material, among which may be mentioned one which is very common upon the Sumach, and which produces a jumping, oval Leaf-beetle (*Blepharida rhois*, Foerster), about a quarter of an inch long, and of a yellow color, speckled with brick-red. The larvæ of certain Tortoise-beetles (*Cassida*), some of which feed on the Morning Glory and the Sweet Potato vines, adopt the same practice, but in their case there is a forked process at the tail which curves over their backs and receives the requisite supply of excrement.

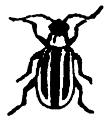
Many authors have supposed that the object of the larva, in all these cases, is to protect its soft and tender body from the heat of the sun. This can scarcely be the correct explanation, because then they would throw away their parasols in cold cloudy weather, which they do not do. In all probability, the real aim of Nature, in the case of all these larvæ, is to defend them from the attacks of birds and of cannibal and parasitic insects.

There are two broods of this species every year. The first brood of larvæ may be found on the potato vine toward the latter end of June, and the second in August. The first brood stays underground about a fortnight before it emerges in the perfect beetle state; and the second brood stays there all winter, and only emerges at the beginning of the following June. The perfect beetle (Fig. 43) is of a pale yellow color, with three black stripes on its back, and bears a general resemblance to the common Cucumber-beetle (*Diabrotica vittata*, Fabr., Fig 44). From this last species, however, it may be readily distinguished by the remarkable pinching in of the sides of its thorax, so as to make quite a lady-like waist there, or what naturalists call a "constriction." It is also on the average a somewhat larger insect, and differs in other less obvious respects. As in the case of the Colorado Potato-beetle, the female, after coupling in the usual manner, lays her yellow eggs (Fig. 42 *d*) on the under surface of the leaves of the potato plant. The larvæ hatching from these require about the same time to develop, and when full grown descend in the same manner into the ground, where they transform to pupæ (Fig. 42 *c*) within a small oval chamber, from which in time the perfect beetle comes forth.

[Fig. 43.]



[Fig. 44.]

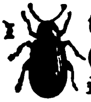


The Three-lined Leaf-beetle, in certain seasons, is a great pest in the Eastern States; but, it has never yet occurred in the Valley of the Mississippi in such numbers as to be materially injurious.

THE CUCUMBER FLEA-BEETLE—*Haltica cucumeris*.*—Harris.

(Coleoptera, Chrysomelidæ.)

[Fig. 45.]



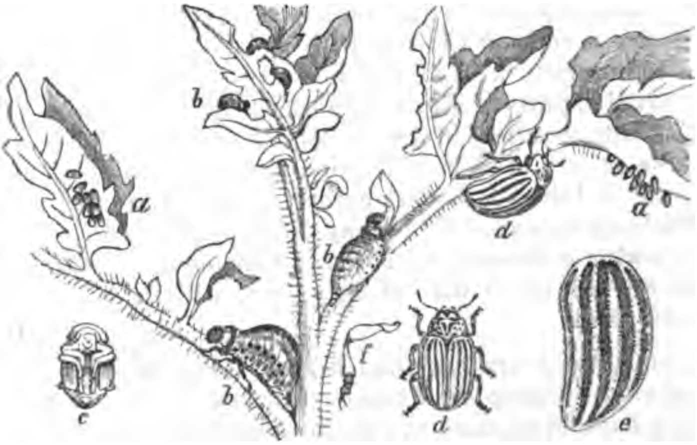
This minute Beetle (Fig. 45) belongs to the Flea-beetles (*Haltica* family), the same sub-group of the Leaf-beetles (*Phytophaga*) to which also appertains the notorious Steel-blue Flea-beetle (*Haltica chalybea*, Illiger), that is such a pest to the vineyardist. Like all the rest of the Flea-beetles, it has its hind thighs greatly enlarged, which enables it to jump with much agility. It is not peculiar to the potato, but infests a great variety of plants, including the cucumber, from which it derives its name. It operates by eating minute round holes into the substance of the leaf which it attacks, but often not so as to penetrate entirely through it. In South Illinois whole fields of potatoes may often be observed looking seared and yellow, and with their leaves riddled with the round holes made by this insect. The larva feeds internally upon the substance of the leaf, like that of the closely-allied European Flea-beetle of the turnip (*Haltica nemorum*, Linn.); and, from its near relationship to that insect, we may infer that it goes underground to assume the pupa state, that it passes through all its stages in about a month, and that there are two or three broods of them in the course of the same season.

THE COLORADO POTATO-BEETLE—*Doryphora 10-lineata*, Say.

(Coleoptera, Chrysomelidæ.)

ITS PAST HISTORY AND FUTURE PROGRESS.

[Fig. 46.]



Up to the autumn of 1865, it was generally supposed by economic entomologists, that this destructive insect had existed from time immemorial in the Northwestern States, feeding upon some worthless weed or other; and that of late years, from some unexplained cause, it had all of a sudden taken to attacking the potato-plant. In October, 1865,

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* Erroneously considered by some authors as identical with the *Haltica pubescens* of Illiger. In this last species, according to Dr. J. L. LeConte, the thorax, instead of being shining, as in our insect, is opaque, with large, dense punctures.

Mr. Walsh showed that originally its exclusive home was in the Rocky Mountains, where it had been known to exist for at least forty-five years feeding upon a wild species of potato peculiar to that region (*Solanum rostratum*, Dunal); that when civilization marched up to the Rocky Mountains, and potatoes began to be grown in that region, it gradually acquired the habit of feeding upon the cultivated potato; that in 1859, spreading eastward from potato patch to potato patch, it had reached a point one hundred miles to the west of Omaha city, in Nebraska; that in 1861, it invaded Iowa, gradually, in the next three or four years, spreading eastward over that State; that in 1864 and 1865, it crossed the Mississippi, invading Illinois on the western borders of that State, from the eastern borders of North Missouri and Iowa, upon at least five different points on a line of two hundred miles; and that in all probability it would in future years "travel onwards to the Atlantic, establishing a permanent colony wherever it goes, and pushing eastward at the rate of about fifty miles a year." (*Practical Entomologist*, Vol. I, No. 1.) A remarkable peculiarity in the eastern progress of this insect was subsequently pointed out by the same writer, in 1866, namely, that "in marching through Illinois in many separate columns, just as Sherman marched to the sea, the southern columns of the grand army lagged far behind the northern columns." (*Ibid*, II, p. 14.)

Now, let us see how far the predictions above, have been verified By the autumn of 1866, the Colorado Potato-beetle, which appears to have invaded the south-west corner of Wisconsin at as early a date as 1862 (*Ibid*, II, p. 101), had already occupied and possessed a large part of the cultivated or southern parts of that State; and in Illinois if we draw a straight line to connect Chicago with St. Louis, nearly all the region that lies to the north-west of that line was overrun by it. It subsequently invaded parts of South Illinois, occurring in Union, Marion, and Effingham counties, in 1868; and already in 1867 it had passed through the eastern borders of North and Central Illinois into Western Indiana, and the south-west corner of Michigan; and finally, in 1868 it made its appearance in many different places in Indiana, and as the following communication from a Cincinnati correspondent of the *Ohio Farmer*, under date of July, 1868, will show, it has even spread into Ohio.

"About three years ago when in your office at Cleveland, you presented me with samples of this devastating insect, the first I had seen; they have been preserved in the collection of one of the best entomologists of Ohio. You had received the beetles from some correspondent in Iowa, where it was then ravaging the crops and where it continues to be very destructive. We soon learned that the insects were progressing eastward at the computed rate of about thirty miles a year, and we began to calculate the time when we might expect its appearance in Ohio—which we did not anticipate for some years.

"Having crossed the Mississippi at Rock Island the insects soon traversed the State of Illinois and reached the shores of Lake Michigan, where it might have met a watery grave, but, unfortunately its course was only deflected southward, and there were other cohosts of the invaders, traversing lower parallels, so that by convergence, the force was multiplied and great fears were anticipated by the potato-growers of Northern Indiana and Ohio, and it was supposed that Northern Ohio would be invaded before the Southern portion of this State.

"At the last annual meeting of the Indiana Horticultural Society, in January 1868, the existence of this insect was reported in several counties in the north-western part of that State during 1867, leading us to apprehend that the day of their approach to us was not so distant as we had fondly hoped. Correspondents now inform us that this beetle has reached Lafayette, Indianapolis, Danville, and other points of central Indiana, so that its progress eastward continues with increasing speed.

"We have now to record the actual presence of the Ten-lined Spearman, (*Doryphora* 10-*lineata*,) in the south-western corner of Ohio, a very few specimens of this pest having been taken within the past week in Hamilton county."

Thus it appears that its average annual progress towards the east has been upwards of seventy miles. At the same rate of progression it will touch the Atlantic ocean in about ten years from now, or A. D. 1878.

"But," it will be asked, "how could any entomologists make the mistake of supposing that the Colorado Potato-beetle had always existed in the Northwestern States?" The answer is, that, as was proved three years ago in the article already referred to they inadvertently confounded together two entirely distinct, but very closely allied species, the bogus Colorado Potato-beetle (*Doryphora juncta*, Germar), and the true Colorado Potato-beetle (*Doryphora* 10-*lineata*, Say). The former of these has existed in the South-west from time immemorial, and has long since been known to feed in the larva state upon the horse-nettle (*Solanum carolinense*, Linn,) a wild plant which is exceedingly adundant in our own State. In 1863 Mr. Glover stated that he "had found an insect similar to the Ten-striped Spearman [or true Colorado Potato-beetle] on the common horse-neetle in Georgia." (*Agr. Department Rep.*, p. 579). In 1867 he assured me that this insect, found by him on the horse-nettle in Georgia four years before, was the bogus Colorado Potato-beetle (*D. juncta*,) and that "a Mr. Walter had also found it feeding upon the Egg-plant in Montgomery, Alabama." I discovered this same species in Kentucky in 1864, feeding in conjunction with its larvæ upon a plant, which could have been nothing else but the horse-nettle; and last fall I met with it in great numbers, in St. Louis and Jefferson counties in this State, feeding upon the same plant, in company with its larvæ; and in one instance the larvæ of both the true and the bogus species occurred in company. Thus it appears to inhabit at least five southerly regions, namely South Illinois, Missouri, Kentucky, Georgia and Alabama.

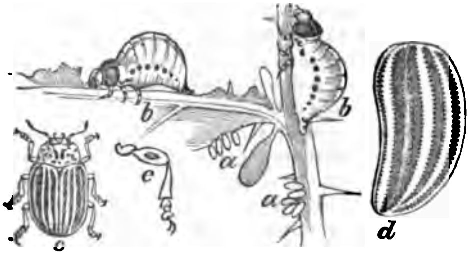
The true Colorado Potato-beetle as has been already stated, only immigrated into Illinois in 1864, and in its native home, the Rocky Mountains, feeds naturally upon another wild species of potato, which is quite distinct from the horse-nettle, and is peculiar to the Rocky Mountain region. Again, the former species has never yet been known to attack the cultivated potato, and in all likelihood never will do so; for, as it has existed in all likelihood never will do so; for, as it has existed in Illinois, for at least 14 years, and in Georgia for at least 44 years, without ever having been known to attack this plant, which has been growing all that time in these two States, it is not at all probable that it will do so at any future time. The latter species, on the other hand, acquired this habit, as was shown before, in the region of the Rocky Mountains, when for the first time the potato was introduced there, some twenty years ago; and from that region the potato-feeding race of this insect has since been spreading further and further every year towards the east. Finally the bogus Colorado Potato-beetle is more peculiarly a southern species, occurring in the more southerly portion of Illinois, and in Missouri, Kentucky, Georgia, and probably Alabama, while the true Colorado Potato-beetle is originally an Alpine species, its native home being the canons (kanyons) of the Rocky Mountains, and it therefore thrives best and spreads fastest in the more northerly regions, such as Nebraska, Iowa, Minnesota, Wisconsin and North Illinois; while in South Illinois, Missouri, and Kansas, it neither thrives so well nor spreads so rapidly.

The question whether the true Colorado Potato-beetle has existed for an indefinitely long time in the country that lies to the east of the Mississippi river, or whether it is not the bogus Colorado Potato-beetle that has there been mistaken for it, while the true Colorado Potato-beetle has in reality immigrated into that country from the Rocky Mountain region within the last four or five years, may seem to some of merely theoretical interest. It is, however, of great practical importance. On the first supposition it is not probable that this bitter enemy of the potato will travel onwards and onwards towards the Atlantic; on the second supposition it will most likely traverse Ohio within a year or two, spread like a devouring flame through the great potato-growing State of Michigan, and finally pass eastwards into Pennsylvania, New York, and New England. I shall, therefore, briefly point out the minute but invariable characters which distinguish them both in the larva and perfect beetle states.

I had an excellent opportunity of comparing the larvæ of *juncta* with those of 10-*lineata*, from alcoholic specimens which were kindly sent to Mr. Walsh by Mrs. H. C. Freeman, of Cobden, Illinois, and from numerous living specimens which I found around St. Louis.

At Figure 46, the true Colorado Potato-beetle is represented in all

[Fig. 47].



its varied stages; *b*, *b*, *b* representing the larvæ of three different growths and sizes. In the annexed Figure 47, *b*, *b*, represents the full grown larvæ of the bogus Colorado Potato-beetle. It will be seen at once that the head of the former is black, that the first joint behind the head is pale and edged with black behind only, that there is a double row of black spots along the side of the body, and that the legs are black, the ground-color of the body being of a Venetian-red. In the other larva (Fig. 47 *b*), on the contrary, the head is of a pale color, the first joint behind the head reddish-brown and edged all round with black; there is but a single row of black spots along the side of the body and the legs are pale, while the ground color of the body is of a pale cream, tinged with pink or flesh color. Such are the distinguishing characteristics of the two larvæ; but it is an interesting fact that these characters are not always constant. Thus the individuals of the second (last summer's) brood of 10-*lineata* larvæ which fed on the horse-nettle in my garden were all of them much paler than were those of the first, potato-feeding brood, from which they had descended; and furthermore the lower row of spots was very indistinct and in many entirely obsolete, while the head, instead of being black was entirely brown. Whether this variation from the normal type was due to the food-plant or not, I shall not at present offer an opinion, but I should have been doubtful about the species had I not bred the perfect beetle (10-*lineata*) from them. Again as I shall immediately show the young larva of *juncta* similates in its markings the mature larva of 10-*lineata*.

The eggs of 10-*lineata* (Fig. 46, *a*, *a*) are of a translucent orange-red color, while those of *juncta* (Fig. 47, *a*, *a*) are whitish, with a faint tinge of flesh-color, and still more translucent. The newly hatched larvæ of the former are of a dark Venetian-red, and they become lighter as they grow older, while the newly hatched larvæ of the latter have the body as light as the full grown individuals. Singularly enough, however, the newly hatched larvæ of *juncta* instead of having the light yellow head and the single row of spots of the mature individuals, have a brown head and *two* rows of spots, the lower being less distinct than the upper row, and placed exactly in the same position as the lower row on the *mature* larvæ of 10-*lineata* (see Fig. 46 *b*, lower figure).

I subjoin a more full description of *Doryphora juncta*. That of the larva of *Doryphora 10-lineata* will be found in Dr. Fitch's *N. Y. Reports*, Vol. III, pp. 231–2. According to Dr. Fitch, the ground-color of this last larva is "pale-yellow" in the mature state; according to Dr. Shimer, in his excellent article on the preparatory stages of this insect, it is "orange." In the immature larvæ it is almost always of a dull Venetian-red, though in the mature larvæ the color becomes lighter. Indeed in some instances it becomes almost as pale as that of *D. juncta*. I saw a number of such pale individuals among the late broods of last summer, though I had never seen them so pale before, notwithstanding I have witnessed great numbers of them every year, since 1863.

DORYPHORA JUNCTA, Germar.—*Mature larva.*—General color a pale yellowish flesh-color. Head bright gamboge-yellow, with the antennæ placed behind the base of the mandibles, short and very robustly conical, three-jointed, joints 2 and 3 black. Precisely as in 10-*lineata*, there are six small simple black eyes upon each side, one pair longitudinally arranged and placed below the antennæ, the other two pairs arranged in a square and placed a little above and behind the antennæ; tip of the mandibles black. Body, with the dorsum of joint 1 composed of a separate transverse horny plate, rounded at the sides, of a rich shiny vandyke-brown, with the edges somewhat raised, and jet black and with a fine line of a lighter color running through the middle from the posterior to the anterior edge. Joints 1—3 each, with a lateral horny black tubercle, that of joint 1 placed below and behind the horny prothoracic plate, and enclosing a spiracle. Joints 4—11 each with a similar lateral tubercle enclosing a spiracle; but the row composed of these eight tubercles is placed a little above the row of three tubercles on joints 1—3, and the last four of the eight are gradually smaller and smaller, until that on joint 8 is reduced to a simple black spiracle. Legs pale yellow; coxæ exteriorly dark brown, the two hinder pairs each more and more so, with a geminate horny plate above each, which becomes more and more brown in each successive pair. An exterior dusky dot, or small spot, on the tip of the femur and of the tibia. Tarsus small, one-jointed, brown, and with a black claw.

The body has a distinct translucent dorsal heart-line, and has usually a shade of the same color both above and below the lateral row of black tubercles; while there are two transverse dark-brown bands across the extreme tip of the body, which is used as an anal proleg. This larva, when well fed, is very smooth and swollen, though it soon becomes wrinkled after fasting. The pink tint of the body is more intense on the neck and between the legs.

Now let us see what are the differences in the perfect beetle state of these two insects, in which state even a practised entomologist would, at first sight, be apt to confound them together. Indeed, so minute are the differences, that in a drawing of the natural size, it is scarcely possible to exhibit them, but with the greatly enlarged leg and wing-case of each species, which are given in the foregoing figures, we shall readily be enabled to do so. Figure 46, *d*, *d*, exhibits the true Colorado Potato-beetle; Figure 47, *c*, the bogus Colorado Potato-beetle, each of its natural size. Figure 46, *e*, shows the *left* wing-case enlarged, and Figure 46, *f*, an enlarged leg of the former; Figure 47, *a*, the *left* wing-case enlarged, and Figure 47, *e*, an enlarged leg of the latter. On a close inspection it will be perceived that in the former (Fig. 46, *e*) the boundary of each dark stripe on the wing-cases, especially towards the middle, is studded with confused and irregular punctures, partly inside and partly outside the edge of the dark stripe; that it is the third and fourth dark stripes, counting from the outside, that are united behind; and that in the leg both the knees and the feet are black. In the latter (Fig. 47, *d*), on the contrary, the dark stripes are accurately edged by a single regular row of punctures placed in a groove (*stria*); it is the second and third stripes—not the third and fourth—counting from the outside, that are united behind, the space between them being almost always brown; and the leg is entirely pale, except a black spot on the middle of the front of the thigh.

The spots on the thorax, in either of the above two species, are normally eighteen in number, arranged in the same very peculiar pattern which may be seen both in Figure 46, *d*, *d*, and in Figure 47, *c*; and precisely the same variations in this complicated pattern occur in either species.

Thus, these two beetles differ essentially from one another upon a strict comparison; but the general resemblance is so great that it is not to be wondered at that the two have been confounded together by several otherwise well qualified observers.

HABITS OF THE COLORADO POTATO-BEETLE.—This insect *can* fly, though it does so very reluctantly and only during the heat of the day. Its wings, like those of several allied species, are of a bright rose-color, and with its cream-colored body, and the five black stripes upon each wing-case, it presents a beautiful appearance as it flies abroad in the clear light of the sun. Its transformations were first made known by myself in the *Prairie Farmer* for August 8, 1863. Subsequently, in 1866, Dr. Shimer, of Mt. Carroll, detailed some additional particulars bearing on its habits, in a paper which he published in the *Practical Entomologist* (vol. 1, pp. 84–85). In the latitude of St. Louis there are three broods during the year, the last brood wintering over in the beetle state underground. They are usually dug up in the spring of the year in land that had been planted to potatoes the year before. The beetles issue of their own accord from the ground about the first of May, and the last brood of beetles enters the ground to hybernate during the month of October. Though, in general terms, this beetle may be said to be three-brooded, yet it may be found at almost any time of the year in all its different stages. This is owing to the fact that the female continues to deposit her eggs in patches from time to time—covering a period of about forty days; and also from the fact that among those larvæ which all hatch out in one day, some will develop and become beetles a week and even ten days earlier than others. Thus it may be that some of the late individuals of the third brood pass the winter in the pupa state, though the normal habit is to first transform to beetles. Each female is capable of depositing upwards of a thousand eggs before she becomes barren, and in from thirty to forty days from the time they were deposited, they will have produced perfect beetles. These beetles are again capable of depositing eggs in about two weeks after issuing from the ground, and thus, in about fifty days after the egg is laid, the offspring begins to propagate. The pupa of the Colorado Potato-beetle is represented at Figure 46, *c*. It is formed in a little cavity which the larva had made perfectly smooth and hard, and it is of the same color as the larva. The beetle, on first emerging from it, is quite pale and soft, without any markings whatever.

Unlike many other noxious insects, this larva is not a general feeder, but is confined to plants belonging to the potato family (*Solanaceæ*), and especially to the genus to which the potato belongs (*Solanum*). Occasionally it feeds on the tomato, on the ground-cherry (*Physalis*), and on the imported Jamestown-weed, or gympson-weed (*Datura*). It prefers the horse-nettle (*Solanum carolinense*) to some varieties of the potato, and were it not that the nettle is considered a nuisance, on account of the difficulty of eradicating it when once introduced, it would be a good plan to encircle a potato field with a row of nettles, so as to concentrate the insects, and thus more readily destroy them. It is also even more destructive to the egg-plant than to the potato. Now, the egg-plant, the horse-nettle, and the potato, all three of them belong to the same genus (*Solanum*), as the wild plant upon which the larva originally fed in the Rocky Mountain region; but the egg-plant and the horse-nettle are botanically more closely related to the last than is the potato; being, like the Rocky Mountain potato, covered with thorny prickles, while the cultivated potato is perfectly smooth. On the other hand, the cultivated potato is much more nearly related to the Rocky Mountain species than is the tomato; which last has, by modern botanists, been removed from the genus to which the other two appertain, and placed in a genus by itself. It would seem, therefore, that the closer a plant comes to the natural food-plant of the insect, the better the insect likes it.

The beetles have been sent to me, as taken from other plants, and even from the raspberry, but I could never succeed in making them feed on any plant that did not belong to the potato family, though I am informed by my friend, Edgar Sanders, of Chicago, that they greedily attack the tubers after they are dug, and he has found as many as six in a single potato.

It is undoubtedly a most singular and noteworthy fact that, out of two such very closely allied species as the bogus and the true Colorado Potato-beetles, feeding respectively in the first instance upon very closely allied species of wild potato (*Solanum rostratum* and *S. carolinense*), the former should have pertinaciously refused, for about half a century, to acquire a taste for the cultivated potato, with which it was all the time in the closest and most immediate contact, while the latter acquired that taste as soon as ever it was brought into contact with that plant. But, after all, this is not so anomalous and inexplicable as the fact that the Apple-maggot Fly (*Trypeta pomonella*, Walsh), which exists both in Illinois, New York, and New England, and the larva of which feeds in Illinois upon the native haws, and has never once been noticed to attack the imported apple there, should, within the last few years, have suddency fallen upon the apple, both in New York and New England, and in many localities there, have become a more grievous foe to that fruit than even the imported Apple-worm (*Carpocapsa pomonella*, Linn.)*

Thinking that the bogus Colorado Potato-beetle might be compelled to feed on the potato in a state of confinement, I gave it every opportunity; but though the larvæ, when transferred from the horse nettle, fed more or less on potato leaves, they invariably became sickly and eventually died. But even if they had actually fed upon potato leaves quite freely in a state of confinement and developed into beetles it by no means follows that the mother beetle would deposit her eggs upon the potato in a state of nature, and thereby compel her future progeny to feed upon that plant. That she will do so upon her natural food-plant, the horse-nettle, we know; and, according to Mr. Walter of Alabama, she will do so upon the egg-plant, which is thorny like the horse-nettle. But apparently she is indisposed to go one step further, and lay her eggs upon a smooth species of the same botanical genus, namely the potato.

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* See on this subject the First Annual Report on the Noxious Insects of Illinois, by Benj. D. Walsh, pp. 29-30, in the Transactions of the Illinois State Horticultural Society for 1867.

Natural Remedies.—Persons not familiar with the economy of insects are continually broaching the idea that, because the Colorado Potato-beetle is in certain seasons comparatively quite scarce, therefore it is about to disappear and trouble them no more. This is a very fallacious mode of reasoning. There are many insects—for instance, the notorious Army-worm of the north (*Leucania unipuncta*, Haworth) —which only appear in noticeable numbers in particular years, though there are enough of them left over from the crop of every year to keep up the breed for the succeeding year. There are other insects—for instance the Canker-worm (*Anisopteryx vernata*, Peck)—which ordinarily occur in about the same numbers for a series of years, and then, in a particular season and in a particular locality, seem to be all at once swept from off the face of the earth. These phenomena are due to several different causes, but principally to the variation and irregularity in the action of cannibal and parasitic insects. We are apt to forget that the system of Nature is a very complicated one—parasite preying upon parasite, cannibal upon cannibal, parasite upon cannibal, and cannibal upon parasite—till there are often so many links in the chain that an occasional irregularity becomes almost inevitable. Every collector of insects knows, that scarcely a single season elapses in which several insects, that are ordinarily quite rare, are not met with in prodigious abundance; and this remark applies, not only to the plant-feeding species, but also to the cannibals and the parasites. Now, it must be quite evident that if, in a particular season, the enemies of a particular plant-feeder are unusually abundant the plant-feeder will be greatly diminished in numbers, and will not be able to expand to its ordinary proportions until the check that has hitherto controlled it is weakened in force. The same rule will hold with the enemies that prey upon the plant-feeders, and also with the ememies that prey upon those enemies, and so on *ad infinitum*. The real wonder is, not that there should be occasional irregularities in the numbers of particular species of insects from year to year, but that upon the whole the scheme of creation should be so admirably dove-tailed and fitted together, that tens of thousands of distinct species of animals and plants are able permanently to hold their ground, year after year, upon a tract of land no larger than an ordinary State.

To illustrate the decrease in its numbers which took place in the State of Iowa from 1867–8, I will state that Mr. Henry Tilden, of Davenport, who had previously made tomato and potato growing a specialty, was forced to go to raising small grains on its account, in 1867, having lost 30 acres of potatoes by its ravages in 1866; while in 1867 Mr. Suel Foster, of Muscatine, Iowa, offered a large premium to any one who would insure his crop of potatoes. Now I have received numbers of letters which go to show that the damage done to potatoes in Iowa in 1868 was comparatively very slight, and the following article which Mr. Foster published in the *Prairie Farmer* of May 16th, 1868, sufficiently demonstrates that Mr. F. would have been the loser, had any insurance company seen fit to insure his crop on his own terms:

"For three years past I have given the most discouraging accounts of the ruinous destruction of our almost indispensable potato crop. I now have a word of encouragement. Last year I planted very sparingly of potatoes; the year before, by great perseverance, I succeeded in raising a few Early Goodrich and Harrison, by continual picking and killing the bugs, and last year planted the product on a new piece of land where no potatoes had been raised; but the bugs found them as soon as they were up; I picked the bugs awhile, then gave them up to their destruction, and the potatoes were nearly destroyed. About the first to the tenth of June the bugs began to diminish. We found the little red and black spotted lady bug quite numerous and active, eating the eggs of the potato bug. I didn't believe those little lady bugs could possibly destroy enough of the eggs of the potato bugs to materially check their increase; but there were but very few of the second brood that hatched in this part of the country, and our late and strong growing potatoes were a full crop.

"What became of the bugs that were so numerous in May and the first of June? The lady bug, with a little assistance from a few other insects, destroyed their eggs. Last May the weather was very wet and cold, yet the bugs increased, and although more stiff and clumsy than in dry, warm weather, they were hearty at their food. Had June been cold and wet, I should have thought their disappearance was caused by that; but June was a very favorable time for their increase and spread on the wing by night. The Colorado potato bugs nearly all disappeared here in June, and not a bug have we seen in plowing and digging in the ground this spring, while in former seasons we used to find them plentifully. I believe some will make their appearance this year, but I fully believe that the same cause which destroyed them so early last year—the lady bug and others, some of which preyed upon the young potato bugs—will prevent their increase this year. If the above are not the facts in this case, can any one tell us facts and theories that are more reliable? It is true, I am not as positive about this as if I had met a regiment of rebels, and had counted the dead and prisoners, to tell what had become of them. But we, in this region, do not expect the bug this year, and are planting potatoes with very little hesitation. Your readers may rely upon this as the fate of the potato bug for the present, and I will write you again in a month, or as soon as I get additional news from him.

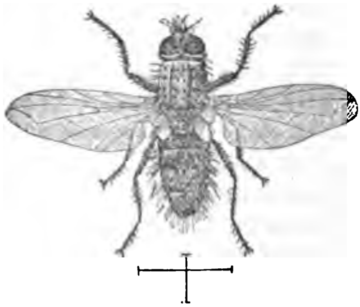
“The Illinois correspondent of the *Country Gentleman*, writing from Champaign county, says:

“Those plowing old potato ground where these creatures operated extensively last year, find the ground full of the dormant wretches. We, at Muscatine, Iowa, will lend them our Benson's Horse Power Potato Bug Killer, but we can't spare our lady bugs.”

The following enemies of the Colorado Potato-beetle, are among the most prominent which have been instrumental in checking its ravages during the past summer.

THE COLORADO POTATO-BEETLE PARASITE—*Lydella doryphoræ*, N. Sp. (*Diptera Tachinidæ*.)

[Fig. 48.]



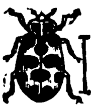
This fly (Fig. 48) has probably been more efficient in checking it than any one other insect, at least in our own State. Until last year no parasitic insect whatever was known to prey internally upon it, but this fly destroyed fully ten per cent. of the second brood and fifty per cent. of the third brood of potato-beetles that were in my garden. It bears a very close resemblance, both in color and size, to the common house fly, but is readily distinguished from the latter by its extremely brilliant silver-white face. It may be seen throughout the summer months flying swiftly from place to place, and deftly alighting on fence or wall, where, basking in the sun, its silvery face shows to good advantage. As with the rest of the family to which it belongs, the habit of the female is to attach a single egg externally to the body of the Potato-beetle larva. This egg subsequently hatches into a little footless maggot, which burrows into the body of its living victim, and eventually destroys it, but not until it has gone underground in the usual manner. The victimized larva instead of becoming a pupa, and eventually a beetle, as it would have done had it not been attacked, begins to shrink as soon as it enters the ground, and gradually dies; while inside its shriveled skin the parasitic maggot contracts into a hard brown pupa, and in due time issues forth in the shape of the fly which I have figured. I am indebted to Mr. Wm. LeBaron, of Geneva, Illinois, for the generic determination of this fly. It belongs to the genus (or sub-genus) *Lydella* Macquart, and is very closely allied to *Tachina* proper, with which it could properly be united, did not the great number of species require a division as a matter of necessity. I subjoin a more detailed description of the fly:

LYDELLA DORYPHORÆ, New Species.—Length 0.25. Alar expanse 0.48. Antennæ black. Palpi fulvous. Face silvery white. Front silvery, tinted with pale golden-brown, with a broad middle stripe black. Thorax cinereous with imperfect black stripes. Abdomen black and silvery-

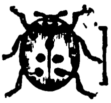
ash, changing into each other when viewed from different angles. When viewed from above: first segment deep black with a posterior border of silver-ash very narrow in the middle, much widened laterally, but abreviated at the sides of the abdomen. The other segments with the basal half silvery-ash, terminal half black. Legs black. Fourth longitudinal vein of the wings straight after the angle. Posterior transverse vein arcuate.

Described from numerous bred specimens.

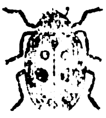
[Fig. 49.]



[Fig. 50.]

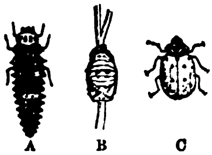


[Fig. 51.]

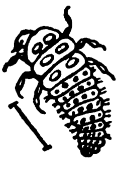


LADYBIRDS.—In the egg state the Colorado Potato-beetle is preyed upon by no less than four distinct species of Ladybirds. Foremost among them is the Spotted ladybird (*Hippodamia maculata*, DeGeer) which is one of our most common species and is of a pink color, marked with large black spots as in Figure 49. Next comes the Nine-spotted ladybird (*Coccinella 9-notata*, Herbst) which is of a brick-red color and marked with 9 small black spots as in Figure 50. Next, the Thirteen-spotted ladybird (*Hippodamia 13-punctata*, Linn.) which is also of a brick-red color but marked with 13 black spots as in Figure 51. And last but not least, the little species figured at 52, *a*, which may be known as the Convergent ladybird (*Hippodamia convergens*, Guer.) and which is of an orange-red color marked with black and white as in the figure. This last species alone has been of immense benefit in checking the ravages of the Potato-beetle. Its larva is represented of the natural size at Figure 52, *a* its colors being blue, orange and black; when full grown it hangs by the tail to the underside of a stalk or leaf and transforms into the pupa represented at Figure 52, *b*. In this state it is of the exact color of the Colorado beetle larva and is doubtless quite often mistaken for that larva and ruthlessly destroyed. It may readily be distinguished however by its quiescence, and let every potato grower learn well to recognize it and spare its life! The larvæ of all these ladybirds are more bloodthirsty in their habits than the perfect beetles, and the larva of the little Convergent ladybird is so essentially a cannibal that whenever other food fails, it will turn to and devour the helpless pupæ of its own kind. It is a rather cruel and withal a somewhat cowardly act to thus take advantage of a helpless brother; but in consideration of its good services, we must overlook these unpleasant traits in our little hero's character! All these larvæ bear a strong general resemblance, and with the aid of Figure 52 *a* and the annexed Figure 53, a good idea may be obtained of them. They run with considerable speed, and may be found in great numbers upon almost all kinds of herbage. The larvæ of certain species that prey upon the Hop Plant-louse in the East are well known to the hop-pickers as "black niggers" or "serpents," and are carefully preserved by them as some of their most efficient friends.

[Fig. 52.]



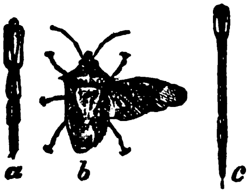
[Fig. 53.]



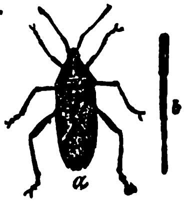
The eggs of ladybirds greatly resemble those of the Colorado Potato-beetle, and are scarcely distinguishable except by their smaller size and by a much smaller number being usually collected together in a single group. As these eggs are often laid in the same situation as those of the potato-feeding insect, care must be taken by persons who undertake to destroy the latter, not to confound those of their best friends with those of their bitterest enemies.

The Spined Soldier-bug.—In the larva state the Colorado Potato-beetle is extensively depredated on, both in Illinois, Missouri and Iowa, by the Spined Soldier-bug (*Arma spinosa*, Dallas), which is of an ochre-yellow color and is represented with one pair of wings closed and the other pair extended, in the annexed Figure 54.—Thrusting forwards his long and stout beak, he sticks it into his victim, and in a short time pumps out all the juices of its body and throws away the empty skin. He belongs to a rather extensive group (*Scutellera* family) of the true bugs (*Heteroptera*), distinguishable from all others by the very large scutel, which in this genus is triangular, and covers nearly half his back. Most of the genera belonging to this group are plant-feeders, but there is a sub-group (*Spissirostres*) to which our cannibal friend belongs, characterized by the robustness of their beaks, and all of these, seem to be cannibals. To illustrate to the eye the difference between the beaks of the cannibal sub-group and the plant feeding sub-groups of this family, Figure 54 *a* gives a magnified view of the beak of our insect seen from below, and Figure 54 *c* a similarly magnified view of that of a plant-feeder belonging to the same family (*Euschistus punctipes*, Say), which is so nearly of the same size, shape and color as our cannibal friend, that at first sight many persons would mistake one for the other. The Spined Soldier-bug, however, may be at once distinguished from all allied bugs, whether plant-feeders or cannibals, by the opaque brown streak at the transparent and glassy tip of its wing cases.

[Fig. 54.]



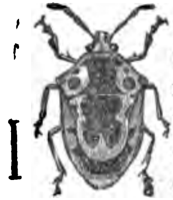
[Fig. 55.]



It has sometimes been reported that the common Squash-bug (*Coreus tristis*, DeGeer) preyed upon the Colorado Potato-beetle; but there can be little doubt but that the Spined Soldier-bug has in these instances been mistaken for it. The colors of the two are somewhat similar but in the eyes of an entomologist the Squash-bug looks as different from the Spined Soldier bug as a cow does from a horse! The figure (55, *a*) of the former which is given above, opposite to that of the latter, will enable any one to recognize the difference, while its magnified beak (Fig. 55, *b*) indicates by its slenderness that it is a plant-feeder.

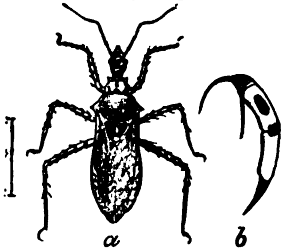
The Spined Soldier-bug by no means confines himself to Potato-beetle larvæ, but attacks a great number of other insects.

[Fig. 56.]



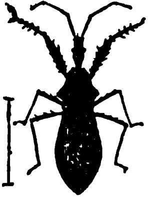
THE BORDERED SOLDIER-BUG.—This is another insect which attacks the Colorado Potato-beetle. It belongs to the same sub-group, and has the same kind of short robust beak as the preceding, but unlike that species, it is so conspicuously and prettily marked that it cannot easily be confounded with any other. Its colors are dark olive-green and cream-color, marked as in Figure 56. It is not so common as the preceding species.

[Fig. 57.]



THE MANY-BANDED ROBBER.—Another true bug, still more elegantly marked than the preceding, (*Harpactor cinctus*, Fabr.,) was observed by Dr. Shimer, of Mt. Carroll, Illinois, to attack the Colorado larvæ, and I found it attacking the same larva in our own State the present year. Like the Spined Soldier-bug, this species is common, and inhabits trees more commonly than herbaceous plants. But it belongs to an entirely different group of the true Bugs (*Reduvius* family), all of which, without exception, are cannibals, and are characterized by a short, robust, curved beak (Fig. 57, *b*, profile view, magnified). Figure 57, *a*, gives a magnified view of this bug, the colors being yellow, white and black, and it may be known by the name of the Many-banded Robber.

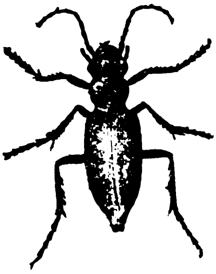
[Fig. 58].



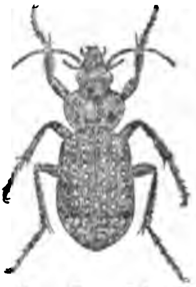
THE RAPACIOUS SOLDIER-BUG.—Still another bug belonging to the very same group as the preceding (*Reduvius raptatorius*, Say), I have found sucking out the juices of the Colorado larva, and specimens were sent to me by S. H. Kriedelbaugh, of Clarinda, Iowa, who found it with the same commendable habit in that State. This bug is represented at Figure 58. It is of a light brown color, and may be known by the name of the Rapacious Soldier-bug.

The above four insects are all of them true bugs, and attack the larvæ of the Colorado Potato-beetle with the only offensive weapon that they have—their beak. The four following (Figs. 59 to 62) are all beetles, and are consequently provided with jaws, so that they are able to eat up their victims bodily; and all of them, except the first, which is confined to southerly latitudes, are common throughout the Western States. Most, if not all, of them prey indifferently upon the Colorado larva and the perfect insect produced from it.

[Fig. 59.]



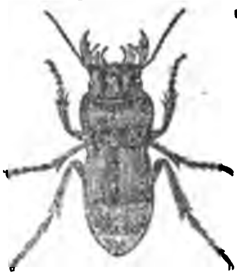
[Fig. 60.]



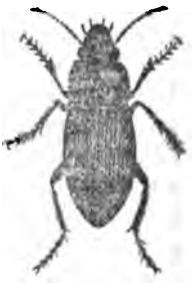
THE VIRGINIAN TIGER-BEETLE.—This beetle (*Tetracha Virginica*, Hope) is of a dark metallic green color, with brown legs, and the annexed cut (Fig. 59) will enable its recognition without much difficulty.

THE FIERY GROUND-BEETLE.—This beetle (*Calosoma calidum*, Fabr.) has already been treated of on page 89 where its larva is illustrated and termed the "Cut-worm lion." The beetle is of a black color, with coppery dots, as shown in Figure 60, and has also been found to prey on the Colorado larva.

[Fig. 61.]



[Fig. 62.]



THE ELONGATE GROUND-BEETLE.—This pretty and conspicuous insect (*Pasimachus elongatus, Lec.*) is another enemy of the Colorado Potato-beetle. It is of a polished black color edged with deep blue, and is of a rather elegant form, being represented at Figure 61.

THE MURKY GROUND BEETLE.—Finally this beetle (*Harpalus caliginosus*, Say) which is of a dull black color, and which is represented life-size at Figure 62, has the same commendable habit as the other three. There are ten or twelve other beetles mostly of small size, which have the same habits as the above; but they would not be readily identified from an uncolored drawing.

BLISTER BEETLES.—Strange as it may seem, the Striped Blister-beetle (Fig. 39, p. 97), and the Ash gray Blister-beetle (Fig. 40, *a*, p. 98), which have already been described as very injurious to the potato, seem to have the redeeming trait of also preying occasionally on the larva of the Colorado Potato-beetle. It was at first difficult to believe or reconcile the statements to this effect which were reported during the summer, but there have been so many of them that the fact may now be considered as indisputable, and these two Blister beetles may therefore, with propriety, be placed in the list of the enemies of the Colorado beetle. I by no means advise their protection, however, on this account; for I believe that what little good they accomplish is much more than outweighed by the injury they do us. As authorities for these statements may be quoted, among many others, Abel Proctor, of Jo Daviess county, Ill., and T. D. Plumb, of Madison, Wis.

"When dog eats dog, then comes the tug of war;"

when rogues fall out, honest men come by their own. And now that certain potato-beetles have taken to feeding upon other potato-beetles, the American farmer may justly lift up his voice and shout for joy.

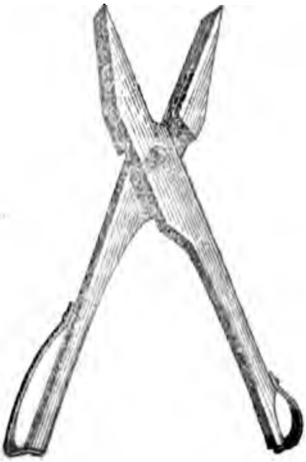
Neither ducks, geese, turkeys nor barn-door fowls will touch the larva of the Colorado-beetle when it is offered to them; and there a-numerous authentic cases on record, where persons who have scalded to death quantities of these larvæ, and inhaled the fumes from their bodies have been taken seriously ill, and even been confined to their beds for many days in consequence.

Artificial Remedies.—It only remains to say something on the most approved method of fighting the Colorado Potato-beetle. A great deal may be effected by raising your potatoes at a point as remote as possible from any ground where potatoes were raised in the preceding year. A great deal may also be accomplished, where there are no other potato patches in the immediate neighborhood, by killing every beetle found upon the vines in the spring, as fast as they emerge from the ground. By this means the evil is nipped in the bud, and a pretty effectual stop is put to the further propagation of the insect. But if there are potato patches near by, where no attention is paid to destroying the beetles, they will keep perpetually flying in upon you in spite of all you can do.

I have already stated that this insect cannot be driven as can the blister beetles, and we have to rely on other measures. I might occupy page after page in detailing the experiments that have been tried by myself and by others. But of all the mixtures recommended I can seriously recommend none. They are impracticable on a large scale, and require too frequent repetition to be efficient, as the beetles issue from the ground day after day. White hellebore, paris green, slaked lime, etc., etc., I have proved by experiment to be valueless, though the two first will kill, if thoroughly applied, a certain proportion of the larvæ, but will not affect the beetles; and even cresylic acid soap, which is the best wash of the kind, does not kill them all. Hot water affects the pests as fatally as any of these applications, and when I state that I have known the beetles to bore through three inches of hard unleached ashes, the folly of *their* application to the vines becomes at once apparent.

I, therefore, again impress upon my readers the importance of prevention by killing every beetle which first appears in the spring. There is no better way of doing this than by crushing them on the spot, and for this purpose a very simple pair of pincers may be constructed. At Figure 63 I represent a pair that were used last summer by S. H. Ford, of Rolling Prairie, Wisconsin, and which were kindly sent to me by L. L. Fairchild of the same place. Their construction is so simple that it needs no explanation, two pieces of wood, a screw, and two small strips of leather being the only things needed.

[Fig. 63.]



In parts of Iowa, the ravages of this insect were so serious in 1866, that a horse-machine was invented for their destruction by Mr. Benson, of Muscatine in that State. As this machine, or some improvement on it, may prove advantageous where potato-growing is carried on extensively, I subjoin an account of it.

"The cost of the machine was about thirty dollars. It consists of a frame-work, which moves astride the row of potatoes, on which is mounted longitudinally a reel somewhat like the one on McCormicks' old Reaper, which knocks the bugs off the plants into a box on one side. This box is of course open on the side next the row nearly down to the ground, but is some two feet high on the outside and at the ends. The reel works over the inner edge of the box, and the bugs are whipped off the vines pretty clean; and the most of them are thrown against the higher side of the box, which converges like a hopper over two four-inch longitudinal rollers at the bottom, between which the bugs are passed and crushed. These rollers are some three or four feet long.

"Those insects which are perched low down on the plants are frequently knocked on to the ground; but I think they would soon crawl up again; and repeating the operation at intervals would very greatly reduce their numbers, and lessen very much the labor of hand-picking, which I think would be advisable in conjunction with the use of the machine, in order to destroy the eggs and diminish the young brood, which is most destructive to the foliage of the plant."

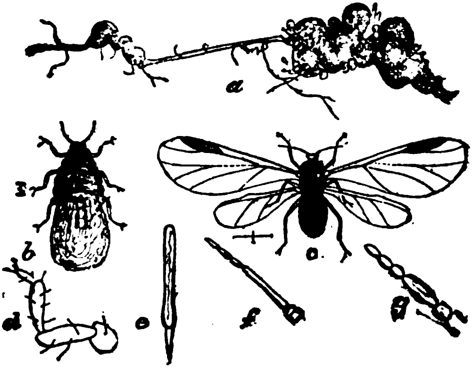
Much may be done by a proper choice of varieties, the Peach-blow having the same immunity from the attacks of this Colorado Potato-beetle, as from those of the Blister-beetles. I have known several instances where Neshannocks, raised side by side with Peach-blows, have been entirely destroyed, while the latter were untouched; and I therefore strongly recommend the planting of Peach-blows in those sections that have been visited by the beetle.

In conclusion let me give another word of caution. Our friends of the Eastern States will, doubtless, in the course of events, become sufficiently acquainted with this beetle. As already stated, it is now in Ohio, and will continue from year to year to spread eastward. Let us, of the West then, not hasten its introduction by our carelessness. Farmers are in the habit of sending insects through the mail to the editors of Eastern papers for identification. Wherever insects are thus sent, they should be thoroughly secured so as to prevent any possible escape. Specimens of this beetle were last year sent to the office of the *American Agriculturist*, in New York, packed in a very insecure manner. Had but a single impregnated female contrived to escape from the package, it might have been the means of prematurely introducing this mischievous pest into that State. A word to the wise is sufficient.

THE APPLE-ROOT PLANT-LOUSE—*Eriosoma* [*pemphigus*] *pyri*, Fitch.

(Homoptera, Aphidæ.)

[Fig. 64.]



The roots of the apple tree are very often found to rot, and thus cause the death of the tree. Of these rots there appear to be three distinct kinds. One kind is that popularly known as "rotten root" in Southern Illinois, and seems to be a simple decomposition of the vegetable tissue, analagous to the rotting of the root of a cabbage for instance. Its cause is not clearly understood, though it seems to be a consequence of certain conditions of the soil. The other rot was discovered the past summer by Dr. Hull, of Alton, Illinois, and is a fungoid growth, which, after covering the root with a thin layer of white fibrous substance, causes a sort of dry rot of the root, and which is common to both the pear and the apple. Some of the symptoms of this rot are: a rather earlier devolopment or maturity of the branches; an excess of fruit buds, and a shortening or thickening of some twigs. Specimens of the affected roots were brought to Dr. T. H. Hilgard, of St. Louis, for experiment, but all that he was able to ascertain was, that it enters the healthy wood in the shape of a brown stringy rot through the canals made by missing fibres.

In a paper read by Dr. Hull, before the Illinois State Horticultural Society, at its 13th annual meeting, a communication was quoted from Judge A. M. Brown, of Villa Ridge, in which the latter gave it as his firm belief that rotten apple tree roots were never caused by root-lice, but by this particular fungus. With due deference to Judge Brown's opinion, I have to differ with him most emphatically, for I am convinced that this Root louse *does cause the roots to rot.* I examined on the 15th of May last, hundreds of young apple trees on the nursery of Mr. J. M. Jordan, of St. Louis. Mr. J. had been greatly troubled with root-lice on his young apple stock during the year 18 7, and had dug up and thrown thousands of young trees into a heap, by which means he expected to kill the lice and prevent their spreading onto new stock. He covered this heap with earth a foot deep, and had the gratification of finding that nearly all the lice had died by the next spring. Many rows of trees—mostly one year grafted—had been left in the ground, however, and on examining these, I found that wherever the previous year the lice had been numerous enough to cover and deform the whole root, there that root had invariably rotted. In many instances all trace of the knots and deformities which the lice cause, had disappeared, while, in some few instances they were yet traceable. In every case where rot had ensued the lice had entirely left, so that not a trace of them could be found. From these, and subsequent observations made during the summer, I conclude that the rot does not ensue till the roots have been completely deformed by the lice, and while on a young tree a colony of lice will multiply sufficiently to entirely cover it in a single season, and thus cause it to rot the next year; on larger trees they may be at work for years before this result is accomplished. This rot from root-lice may, I think, be distinguished from both the other kinds by its being more porous and soft, approximating the brown mould of a rotting log. The unusual swellings and knots caused by the lice, though hard originally, seem to loose their substance, and very frequently the finer roots, and almost always the fibrous roots waste entirely away.

The diagnosis of either of the first two kinds of rot must remain hidden, until our knowledge of these impalpable funguses shall have become more thorough, and until then no remedy can be suggested; but with the last kind, having traced it to its true cause, the means of prevention are at hand, and I will now give the history and description of the Apple-root Plant-louse for the most part as it appeared in the AMERICAN ENTOMOLOGIST for January, 1869:

For the last twenty years a Wooly Plant-louse has been known to infest the roots of the apple-tree, causing thereon swellings and deformations of almost every possible shape, and, when very numerous, killing the tree. In the more northerly parts of the Northern States this insect is comparatively rare, but in southerly latitudes it is exceedingly destructive in apple orchards. According to Dr. Hull, "it is one of the worst enemies against which our apple-trees have to contend, and is much more common in our region than is generally supposed." (*Agr. Rep, Mo., Append.*, p. 451.) As long ago as 1848, Mr. Fulton, of Chester county, Pennsylvania, found this root-louse and the knotty swellings produced by it to be so abundant on nursery-trees in his neighborhood, that thousands of young trees had to be thrown away, and it became difficult to supply the market.) Downing's *Horticulturist*, III, p. 394.) And in August, 1858, M. L. Dunlap (*Rural*) stated in the *Chicago Tribune*, that in an orchard near Alton "the Wooly Aphis infests the roots in immense numbers, and by sucking up the sap destroys the trees, which in its effect has much the appearance of dry rot."

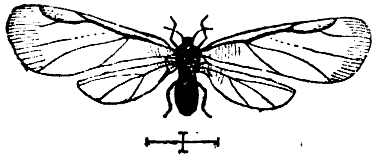
Although this insect usually confines itself to the roots of the tree, yet a few may occasionally be found on the suckers that spring up round the butt of the trunk, and even on the trunk and limbs, especially in places where a branch has been formerly amputated, and nature is closing up the old wound by a circle of new bark. Where it works upon the naked trunk, it often causes a mass of little granulations to sprout out, about the size of cabbage-seeds, thus producing on a small scale, the same effects that it does upon the roots. Wherever the insect works, small as it is, it may be easily recognized by the peculiar bluish-white cottony matter which it secretes from its body, and which is never met with in the case of the common Apple-tree Plant-louse that inhabits the leaves and the tips of the twigs.

Figure 64 at the head of this article, fully illustrates the Apple-root Plant-louse. A portion of a knotty root as it appears after the punctures of the lice is represented at *a*, the larva state at *b*, and the winged state at *c*; while *d* represents the leg, *e* the proboscis, *f* the antenna of the winged individual, and *g* that of the larva, all highly magnified. The young louse is of a deep flesh or pink color, and the proboscis extends the whole length of the body, while the older specimens have a deeper, purplish hue. Of the winged louse, I subjoin a more complete description.

ERIOSOMA PYRI, Fitch—Color black. Antennæ 2-5ths as long as the body, joints 1 and 2 almost confluent, short and robust; joint 3 fully ½ the entire length of the antennæ; joints 4—6 subequal, 5 a little the longest, 6 a little the shortest. Meso-thorax polished. Abdomen opaque with more or less pruinescence. Legs opaque black, immaculate. Wings hyaline; costal and subcostal veins robust and black; stigma pale brown, 2¾ to 3 times as long as wide, pointed at both ends, but more acutely so on the basal end, the vein bounding it behind robust and black. Discoidal veins and stigmal vein slender and black, the 3d or forked discoidal hyaline and subobsolete on its basal ⅓. Length to tip of closed wings 0.13—0.14 inch.

On comparing Figure 64 *c* with Figure 65, which represents a Plant-louse that inhabits a large gall on the Cottonwood, it will be observed at once that the veining of the front wing is very different. In Figure 64, *c*, the third branch-vein is very distinctly forked; in Figure 65 it is simple. Nor is this a mere accidental variation, but a peculiarity of the genus to which either insect belongs. (Fig. 64, *c*, genus *Eriosoma*; Fig. 65, genus *Pemphigus*). Now Dr. Fitch describes and names the Apple-root Plant-louse as belonging to the latter genus (*Pemphigus*); whereas winged specimens which both Mr. Walsh and myself obtained last October, at Duquoin, from apple roots and suckers swarming with larvæ; some which I received from St. Louis county, and others which Mr. Walsh bred from larvæ; all, without exception, belong to the former genus (*Eriosoma*). And moreover, Dr. Fitch's insect is described as being nearly twice as large as ours. How does this come about? We can only account for it in the following way: Dr. Fitch's winged specimens were but two in number, and they were found by him, the one living, the other dead, upon the roots of an infested young apple-tree, which had been brought him from an adjoining county. Hence he very naturally, but as we think erroneously, infer-

[Fig. 65.]

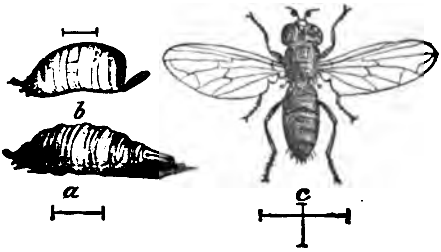


red that these two winged plant-lice belonged to the same species as the minute wingless larvæ with which the infested roots were swarming. The truth of the matter probably was, that the two winged plant-lice got upon the infested apple-root by accident, on their road from the nursery to Dr. Fitch's orchard. Indeed we can almost say with certainty to what species they belonged; for on comparing Dr. Fitch's very minute and elaborate description with the Beech-twig Plant-louse (*Pemphigus imbricator*, Fitch), which comes out in the winged state in the very same time of the year as he met with his two specimens, it agrees sufficiently well to apply to that species. If, on the other hand, we compare his description with our specimens, it not only disagrees generically, as already explained, but neither the size nor the markings will correspond at all.

We consider it, therefore, to be sufficiently certain that the Apple-root Plant-louse does not belong to the genus (*Pemphigus*), to which all subsequent authors, in deference to Dr. Fitch's authority, have hitherto referred it, but to the very distinct genus (*Eriosoma*) to which the notorious Wooly Plant-louse of Europe belongs (*Eriosoma lanigera*, Hausm.)

NATURAL REMEDIES.—From the enormous rate at which all Plant-lice multiply, it is plain that, if there were no check upon the increase of the Apple-root Plant-louse, it would in a few years' time sweep away whole orchards, especially in southern latitudes. Luckily for the fruit growers and fruit-lovers, there exist two at all events, and probably three such checks. The first is a very minute parasitic fly, which Prof. Haldeman figured and described in 1851 as infesting in the larva state his supposed Wooly Plant-louse.* The second is a footless maggot (Fig. 66 *a*) about one-half an inch long, and of a dirty yellow color. It is generally found more or less covered with mud, and with the woolly matter secreted by the lice, and is not by any means easily discerned. It changes in the fall to the pupa state (Fig. 66, *b*) from which, in the following spring, there emerges the perfect fly (Fig. 66, *c*) which may be known as the Root-louse Syrphus-fly. The following is the description of this fly, in its different stages, which appeared in the AMERICAN ENTOMOLOGIST.

[Fig. 66.]



THE ROOT-LOUSE SYRPHUS-FLY. (*Pipiza radicum*, n. sp.) ♀ Shining brown black. *Head* clothed with short, rather sparse, white hairs, especially the lower part of the anterior orbits and the entire space below the antennæ. Mouth dark rufous. Antennæ compressed, with the joints proportioned as 2, 2, 5; joint 2 twice as wide as 1, and 3 twice as wide as 2; of a dull rufous color, edged above, narrowly on the inside, widely on the outside, with brown black. *Thorax* very finely rugoso-punctate, with some short sparse white hairs, especially laterally. *Abdomen* finely punctate, with longer white hairs, rufo-piceous above on the middle ⅓ of joint 1; venter with joint 1 piceous. *Legs* with all the 6 knees, and in the 4 front legs the entire tibia except a spot on the exterior middle, and also all the 6 tarsi except their extreme tips, and except in the hind legs the bassal ⅔ of the first tarsal joint, all dull pale rufous. *Wings* hyaline; veins black. Length ♀ 0.25 inch; alar expanse 0.48 inch.

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* This fly belongs to the *Chalcis* family in the Order *Hymenoptera*, and was named *Eriophilus mali* by Prof. Haldeman. The figure and description will be found in the *Farm Journal* for 1851, pp. 130-1.

One ♀; ♂ unknown. Bred May 23 from a single puparium found in the November preceding. On May 2 this puparium, which in the preceding autumn had been lightly covered with moist sand and deposited in a cellar, had crawled up out of the sand a distance of two inches, and attached itself to the stopper of the bottle in which it was inclosed. Upon being replaced under the moist sand, it was found two days afterwards to have again crawled about an inch up the side of the bottle. We have observed the same locomotive powers in the puparia of several other Syrphidous insects, though, so far as we are aware, this very anomalous faculty has not hitherto been commented on by authors.

We are indebted to Dr. LeBaron, of Geneva, Ills., who has paid special attention to the Order (*Diptera*) to which this insect belongs, for determining the genus to which it is properly referable. According to him, "the genus *Pipiza* differs from *Syrphus* in the absence of the prominence in the middle of the face, in the comparatively greater development of the posterior legs, and in the want of the little spurious longitudinal vein in the middle of the wing." "The only species discovered by Macquart," he adds, "is from Carolina, and very different from yours."

Larva.—Dull pale flesh-color, tinged with yellow. Attenuated and somewhat depressed anteriorly; more blunt posteriorly, the anal segment being furnished with an elevated tube, which is of a light polished brown at extremity. Wrinkled transversely, with a prominent fold at anterior and posterior edge of each segment. The larger segments well defined; the smaller ones less so. First segment thoroughly retractile, and sufficiently translucent when extended, to show the dark triple-jointed mouth. A few soft, fleshy spines, of the same color as the body, and especially distinct on anal segments. Generally covered and disguised by the soil which it inhabits. Length when not extended, 0.23 of an inch. Described from two specimens taken in 1866 and three in 1868.

Pupa.—Dull dirty yellow. Gradually formed by the contraction of the larva, during which time the wrinkles are obliterated, and it at last becomes quite smooth. Length 0.18.

I first found this larva in December, 1866, at Cobden, Ills., and have found it at several different times since, and though I failed to breed any to the perfect state, Mr. Walsh was more fortunate. Wonderful indeed must be that instinct, which enables the mother-fly to perceive which particular trees in an orchard have their roots swarming with lice, so as to know exactly where to deposit her eggs!

The third insect which preys upon these Root plant-lice, at least in Missouri, is a small species of ladybird, belonging to the genus *Scymnus*. The larva of this beetle is still more difficult to recognize among the lice, as it is covered on the back with little tufts of wooly matter, secreted from its own body. It is, when full grown, somewhat larger than the lice, and altogether more active, and is distinguished furthermore, by the wooly matter being of an even length and distributed over the back in transverse rows. Mr. J. F. Waters, of Springfield, Missouri, sent to me a number of the apple root-lice, with some of these little ladybird larvæ among them, which he erroneously supposed to be the old lice. In due time I bred the perfect beetle from them, and it proved to be a species which the French entomologist Mulsant, had described as *Scymnus cervicalis*. It is a very inconspicuous little beetle, about 0.05 of an inch long, and of a deep brown color, the thorax being of a lighter brown. From subsequent correspondence with Mr. Waters I learned that the lice upon which these little friends of ours were preying, were taken right from the surface of the ground, so that it is possible that this ladybird only attacks them when it can get at them above ground; though, judging from analogy, I strongly suspect it also seeks them out in their underground quarters.

Artificial Remedies.—The best mode to get rid of the Apple root Plant-louse is to drench the roots of the infested tree with hot water. But to render this process effectual, the water must be applied in quantities large enough to penetrate to every part of the infested roots. There need be no fear of any injurious result from such an application of hot water; for it is a very general rule that vegetable organisms can, for a short time, stand a much higher temperature than animal organisms, without any injury to their tissues. In laying bare the roots for the better application of the water, a sharp eye should be kept for the friends above described, and when espied they should be tenderly laid aside till after the slaughter of the enemy. Mulching around the infested trees has been found, by Mr. E. A. Riehl and others, of Alton, Illinois, to have the effect of bringing the lice to the surface of the ground, where they can be more easily reached by the hot water.

THE WOOLY ELM-TREE LOUSE—*Eriosoma ulmi*, N. Sp.

(Homoptera Aphidæ.)

The White elm is subject to the attacks of a woolly plant-louse belonging to the very same genus as the preceding. This insect appears to be quite common in our State as well as in Illinois, for I have known several elm-trees on Van Buren street in the city of Chicago, to be killed by it, and every tree of this description, around the court house in St. Louis was more or less affected with it last summer. The lice congregate in clusters on the limbs and the trunks, and cause a knotty unnatural growth of the wood, somewhat similar to the knots produced on the roots of the apple-tree by the other species. They are mostly found sunk in between the crevices formed by these knots, and the punctures of their little beaks cause the sap to exude in the shape of little silvery globules, which may generally be found dispersed among the knots. The down or wooly matter is secreted by them from all parts of the body, but especially from the posterior part of the back. It is of an intense white color, and is secreted in such profusion that it usually covers and hides the lice, and when they are numerous, gives the limbs from a distance the appearance of being covered with snow. They make their appearance during the latter part of May, and by the latter part of June the winged individuals may be found mixed up with the larvæ and pupæ. I have experimentally found that a washing with a weak solution of cresylic acid soap will kill them all instantly, and they are thus easily exterminated. They are also preyed upon unmercifully by the larvæ of an undescribed species of Lacewing fly (*Chrysopa eriosoma* of my MS.).

ERIOSOMA ULMI, N. Sp.—Color dark blue. Length to tip of closed wings, exclusive of antennæ, 0.12. Wings hyaline, three times as long as wide, and more pointed at the ends than in *E. pyri*. Costal and subcostal veins, and that bounding the stigma behind, robust and black. Discoidal veins together with the 3d forked and stigmal veins, all slender and black, the forked vein being as distinct to its base as are the others, with the fork but ⅓ as long as the vein itself and curved in an opposite direction to the stigmal vein. Antennæ 6-jointed and of the same color as the body; joints 1, 2, 4, 5 and 6 of about equal length, joint 3 thrice as long as either. Legs of the same color as body.

The young lice are narrower and usually lighter colored than the mature individuals, varying from flesh or pink to various shades of blue and purple.

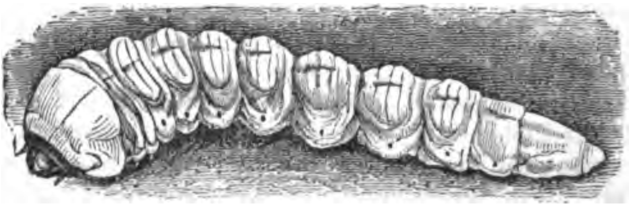
INSECTS INJURIOUS TO THE GRAPE-VINE.

The culture of the grape forms an important branch of Missouri horticulture. There is scarcely another State in the Union that has such natural advantages for the growing of this delicious fruit. While traveling up the Missouri river, I have been struck with the great similarity in the general character of the country to the celebrated Grape-growing districts of the Rhine, in Prussia. The Germans have also so thoroughly settled the country along the Missouri that the resemblance is made still more striking. As another evidence of the importance of this branch of horticulture in our State, the *American Grape Culturist*, the only periodical published in this country that is solely devoted to Grape-growing and wine-making, has just been started in St. Louis, by Mr. George Husmann. It becomes us then to know something of the insects injurious to the vine.

THE NEW GRAPE-ROOT BORER—*Orthosoma cylindricum*, (?) Fabr.

(Coleoptera, Prionidæ.)

[Fig. 67.]



The *ad interim* committees of the Illinois and Missouri State Horticultural Societies, while visiting the orchards and vineyards along the line of the Iron Mountain Railroad, discovered that sundry grape vines on Dr. C. W. Spaulding's place were dying; and on digging up such vines, the roots were found to be entirely hollowed out, and in many instances severed, by a worm which is faithfully represented at the head of this article—Figure 67. At about the same time, Mr. Walsh, of Rock Island, received an immense specimen from W. D. F. Lummis, of Makanda, Illinois, with the same account of its habits, and the following letters which I have since received relate to the same worm:

MR. RILEY—*Dear Sir:* Herewith please find a worm or grub, which has bothered my grape vines, it cuts the vine off about 3 or 4 inches under ground and takes out about an inch. Set vines last spring. Put stakes of oak, green.

Respectfully, &c.,

ALFRED BARTER.

VIRGIL CITY, Mo., August 21, 1868.

PROF. RILEY, *State Entomologist:* I leave here for you a specimen of a worm which has proved very destructive in my vineyard this season having killed 24 vines, usually commencing at the bottom eye and eating the entire stem almost to the surface of the ground. I have dug up all the vines and in each case have found but one worm sometimes as deep as 18 inches below the surface. My vineyard was planted this spring on ground previously cultivated; has been thoroughly subsoiled and is well drained; the vines are Hartford Prolifics aud Concords. Please send any information of value you may have relating to the above to Col. John H. Hogan, Pevely Station, I. M. R. R.

Very respectfully,

JOHN H. HOGAN.

September 3, 1868.

MR. RILEY *Dear Sir:* The Grape-vine borer has been quite destructive in our vineyard this season, having killed 15 vines. Except in two cases we found and dispatched him without mercy. We first noticed the effects of the borer about the latter part of July and frequently found them until the latter part of August. In some instances we found the root severed within ½ half inch of the surface, while the borer was found at the bottom of the root. In others the root was eaten off from 5 to 8 inches below the surface. Only Concord vines have been affected, and only those that we obtained from a neighboring vineyard for planting last spring. Not one of our original vines have been destroyed, though we have 4 acres equally exposed to the attacks of this new destroyer. Any information that you may be able to give us upon this subject will be thankfully received.

Very respectfully,

SIMMONS & TILLSON.

SULPHUR SPRINGS, September 10, 1868.

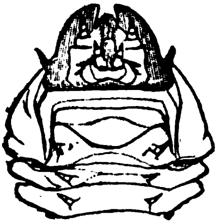
Mr. D. C. Peebles, D. D. S., of St. Louis, also brought me a large Concord vine that had been entirely severed from the roots and killed by this worm, and I also received specimens about ¼ grown from T. W. Guy, of Glenwood.

The above letters convey a very good idea of the manner in which this borer works. It seems to have occurred in the Concord vines more generally than in those of any other variety, but I think that this may be attributed to the fact that more Concords are planted than any other kind, for as the following facts will show the borer is evidently a very general feeder. In the early part of June, 1867, Mr

O. B. Galusha, who was then with the *ad interim* committee visiting Southern Illinois, sent me a worm in all respects similar which was found boring into the root of an apple tree. I have also received Osage orange roots from Kansas which were being bored by the same fellow, and he is evidently partial to rotten oak stumps for not only have several persons who are well able to judge, assured me that they have found him in such stumps, but Mr. A. Bolter, of Chicago, also found it in such stumps in Kentucky, and sent me the specimens for identification. At the meeting of our State Society, at Columbia, Mr. I. N. Stuart even avowed that he had found it partly grown, not only in seedling apples but in the roots of corn stalks, while Chas. Connon, of Webster, assures me that he has found it in the heart of felled hickory, and I ascertained that he was perfectly capable of distinguishing it from the common borer (*Cerasphorus cinctus*, Drury), which infests hickory when felled, and which causes what is known as "powder post," he being quite familiar with this last named insect. There are several large beetles in the West which must have larvæ very similar in appearance to this, and it is not at all unlikely that different insects have here been confounded, but the figure at the head of this article, with the following description of this Grape-Root borer, will enable any one to recognize it in the future.

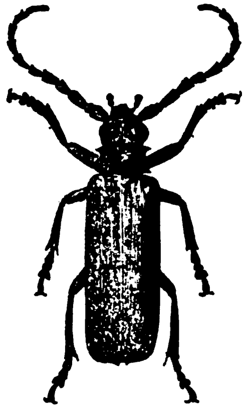
LARVA OF ORTHOSOMA CYLINDRICUM, (?) Fabr.—Average length when full grown, 3 inches. Color pale yellowish white, partly translucent, with glaucous and bluish shadings, and a distinct dorsal line of the last color. Segment 1 rather horny, rather longer than 2, 3 and 4 together, broadening posteriorly, slightly shargreened and whiter than the rest of the body, with a rust-colored mark anteriorly. Segments 2 and 3 shortest and broadest, the body tapering thence gradually to extremity, though there is usually a lateral ridge on segment 12 which dilates it rather more than the segments immediately preceding it. This segment 12 is also the longest, the terminal one being quite small and divided into three nearly equal lobes. A swelled hump crossed with two impressed trnnsverse lines, on segments 4, 5, 6, 7, 8, 9 and 10. Stigmata rust-colored, 9 in number, the first and largest being placed on a fold in the suture between segments 1 and 2. Head brown, verging to black on anterior edge. Mandibles large, strong, black, with one blunt rounded tooth, giving them a somewhat triangular appearance; anntenæ 3-jointed and brown, especially at tip; labrum fulvous, fuzzy and with a brown base; maxillary palpi 4-jointed, the basal joint much swollen, the terminal joint brown, and a ring of the same color at sutures of the other joints; labial palpi 3-jointed, the basal joint also swollen, and the terminal joint and sutures of the others brown. Six rudimentary 2-jointed fuscous feet as shown at Figure 68. Venter tubercled as on the back, these tubercles being especially prominent on segments 6, 7, 8 and 9, where they recall prolegs. The young larva differs only in lacking the rust-colored mark on segment 1.

[Fig. 68.]



Now, to what insect does this borer belong? It is manifestly the larva of some long-horned beetle of the family PRIONIDÆ, but of what particular species cannot be positively stated till the beetle is reared from grape-root-boring larvæ. Before another year shall have passed away, I hope to definitely determine this point, but meanwhile, I have every confidence that it will produce the Cylindrical Orthosoma (*Or-*

[Fig. 69.]



thosoma cylindricum, Fabr.), a large flattened, long-horned light bay-colored beetle which is common throughout the country and especially in the Mississippi valley, and which is represented of the natural size at Figure 69. True, according to Westwood, the larvæ of the PRIONIDÆ have the second segment enlarged and broadened, while the closely allied family CERAMBYCIDÆ, has the first segment thus enlarged as in our insect; but from a larva resembling ours in every respect so far as his description goes, and which he found in September, 1867, in decaying pine wood, Mr. Walsh actually bred, about the last of June, 1868, the Cylindrical Orthosoma. The only accounts on record which pretend to give the natural history of this beetle, are by Dr. Fitch and S. S. Rathvon, that of the former in his 4th Report, § 239, and that of the latter in the Agricultural Reportfor 1861, pp. 611–612. Dr. Fitch describes the larva, which he supposed belonged to this beetle, but which he did not breed, as occurring in pine trees, and as having the first ring longest and the second broadest; while Mr. Rathvon figures it with the first ring infinitely shorter than the second, but confesses that the drawing was made from memory, and he doubtless trusted to the authority of Westwood. Furthermore Monsieur E. Perris has figured at Plate 6, Figure 362, of the "Annales de la Société Entomologique de France," for 1856, the larva of *Prionus obscurus*, Oliv. which bores into the pine and which very closely resembles our larva, the first and not the second segment being enlarged.

Until the past summer nothing had been published about the attacks of this insect on Grape roots, and yet upon inquiry I find that it has been known for several years. Mr. Spaulding informs me that the first that was seen of it in his neighborhood was in 1866, when his man found an enormous one in a wild vine which he was about to graft; but Mr. Geo. Husmann, of Hermann, has been acquainted with it since 1850, and has known it to occur around Hermann since 1854. Indeed Mr. Husmann informs me that he has never observed the old Grape-vine Borer which has 16 legs and which produces a moth (*Ægeria polistiformis*, Harris) but that in speaking of the Grape-root Borer he has always referred to this species. Mr. J. H. Tice found it in apple roots in 1860 on the place of James Sappington of St. Louis, while the following item by A. J. H., of Vineland, N. J., which appeared in the January (1869) number of the *Gardener's Monthly*, would indicate that it has the same habit all over the country:

"On page 354 October number of *Agriculturist*, reference is made to a "vine borer" in Missouri that cuts off vines below the surface. It is also mentioned and partially described in the last *Gardener's*

Monthly. This "borer" is an old friend (?) of mine. It is found principally in old rotten oak stumps; I hardly ever dig one out without finding several of these worms. They are about two inches long, tapering from head to tail, white bodies and black heads. I lose on an average about 50 vines and dwarf pears annually by these little villains; probably twice as many pears as vines. I have had several apple trees cut off by them, and one standard pear. The tree roots seem often to be eaten entirely up, but the vine roots are only cut through as if they had obstructed the line of travel.

This is no new insect, but will I think probably be found troublesome whenever dwarf pears and vines are planted among decayed oak stumps."

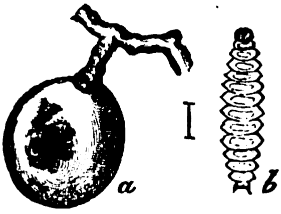
Remedies.—Little can be done in the way of extirpating these underground borers, when, as in the present instance, their presence is only indicated by the approaching death of the vine. Still, every vineyardist should make it a rule to search for them wherever they find vines suddenly dying from any cause unknown to them, and upon finding such a borer should at once put an end to his existence. The beetle which may frequently be found during the summer months, should also be ruthlessly sacrificed wherever met with. I should also advise not to plant a vineyard on land covered with old oak stumps, and not to use oak stakes where those made of cedar can be had as conveniently.

THE GRAPE CURCULIO—*Cœliodes inæqualis*, Say.

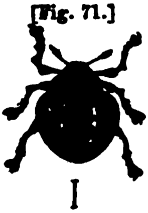
(Celeoptera, Curculionidæ.)

The larva of this Curculio infests the grapes during the months of June and July, causing a little black hole in the skin, and usually a disfigurement and discoloration of the berry, immediately around it as in Figure 70, *a*. The larva (Fig. 70, *b*) is whitish as long as the berry is green, but generally partakes of the color of the berry as it matures. It is footless and like the larvæ of all snout-beetles is incapable of spinning a web. In 1867 I found this insect quite common in Southern Illinois, and as will be seen from the excellent account of it given by Mr. Walsh in his first report, it was very common in the States of Illinois, Ohio and Kentucky, and it also occurred in our own State, as I am informed by Mr. Peabody. From the middle to the last of July, this larva leaves the berry and buries itself a few inches in the ground. Here it changes to a pupa within a small, smooth earthen cavity, and by the beginning of September the above named beetle issues from the ground, and doubtless passes the winter in the beetle state, ready to puncture the grapes again the following May or June. This beetle is

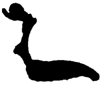
[Fig. 70.]



[Fig. 71.]



[Fig. 72.]



small and inconspicuous, being of a black color with a grayish tint. It is represented enlarged at Figure 71, the hair line underneath showing the natural size. It is distinguished from all other curculios that are known to attack our fruits by having a rectangular thorn or tooth on the upper and outer edge of the four front shanks (*tibiæ*) as shown at Figure 72; this character being peculiar to the genus (*Cœliodes*) to which it belongs.

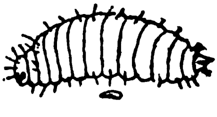
Strange as it may seem, in 1868 there seems to have been an almost entire immunity from this Grape curculio, for I have neither met with it in a single instance, nor heard of its occurrence. No doubt this immunity has been caused principally by parasites, for I failed entirely to breed the perfect Curculio in 1867, on account of some small Ichneumon which killed the larva as soon as the latter had entered the earth, and spun for itself a tough silken cocoon in the place where the Curculio larva, if unmolested, would have undergone its transformations. It is thus that Nature works; "eat and be eaten, kill and be killed," is one of her universal laws, and we can never say with surety that because a particular insect is numerous one year, therefore it will be so the next!

THE GRAPE-SEED CURCULIO.

(Coleoptera, Curculionidæ.)

A minute maggot was discovered last August infesting the seeds of the Grape in certain parts of Canada, by Mr. Wm. Saunders, of London. It causes the berries to shrivel up and utterly ruins them. Specimens which had been received from Canada, were sent to me by my friend A. S. Fuller, of New Jersey, and the annexed Figure 73 shows a highly magnified view of the maggot, its natural size being represented underneath. The head is of the same translucent, milk-white color as the body, but the jaws, which are finely pointed, are light brown, and there is a patch of brown at their base. It has exactly thirteen segments exclusive of the head, and every segment has a few white, fleshy hairs, these hairs being thickest near the head and longest on the under part of the first three segments, thus imitating feet, as is often the case with footless larvæ of this character.

[Fig. 73.]



It is evidently the larva of some curculio, and though it is not yet known to occur in the States, I append the following account of it from Mr. Saunders himself, for the benefit of our Grape-growers:*

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* This account is taken from a paper published by Mr. Saunders in the "Report of the Commissioner of Agriculture and Arts of the Province of Ontario," for 1868—pp. 203-5.

"On the 20th of August last we observed that many of the berries in the bunches of a Clinton vine under our care were shriveling up. On opening the grapes, we observed that most of the smaller berries —that is those which had shriveled earliest—contained only one seed, and that of an unusually large size. Some of the larger shriveled grapes contained two seeds, much swollen, each having a dark spot somewhere on their surface. On cutting the seeds carefully open, the kernel was found almost entirely consumed, and the cavity occupied by a small milk-white footless grub with a pair of brown hooked mandibles, a smooth and glossy skin with a few very fine short white hairs. When at rest it is nearly oval in form, but when in motion its body is elongated, varying in length from one-fifteenth to one-twelfth of an inch. * * *

"The Clinton vine on which this pest was first discovered suffered considerably, fully ten per cent. of the crop was lost from the shriveling of affected berries. At first we supposed that the work of the insect was confined to berries of this appearance, and that by destroying these the destruction of the crop of insects for the season would be complete, but further examination showed that many of the ripe berries contained affected seeds. The proportion thus affected on the vine referred to was about ten or eleven per cent. Within a few feet of this vine an Isabella was fruiting; on this there were no shriveled berries, but about three per cent. of those which had ripened were injured. About the same distance in another direction was a Hartford Prolific, and about ten feet further off a Concord, both of which fruited well. On neither af these were there any shriveled berries, nor could we find any affected seeds among those which had ripened. The fruit of a Delaware, about fifty feet distant from the Clinton, was also examined without discovering any traces of the insect.

"About the middle of September we visited the grounds of Mr. Charles Arnold, of Paris, and there we found that this insect had prevailed to a greater extent than it had with ourselves, affecting the Clinton, Delaware, one of Rogers' Hybrids, and also Mr. Arnold's new seedlings. In Hamilton, in the garden of Mr. W. H. Mills, we found an affected seed in a berry of Rogers' No. 4. On the 24th of September we visited the vineyard of the Vine Growers' Association at Cooksville, but could not find any traces of the insect there. Thus far its depredations are most apparent about London and Paris, but probably further examination will show that it is widely distributed.

"Where any shriveled berries are found their seeds should be carefully opened and examined, as it is important to know how far the insect prevails. The affected berries are usually swollen, somewhat soft, and have a dark spot somewhere on their surface; any of this character observed among the ripe berries should also be examined.

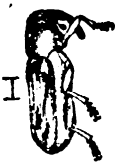
"In the case of the shriveled berries, where one seed only is affected, the others are dwarfed and imperfect; and where two large seeds are found they are both occupied. Where one seed only is affected and the other remains healthy, the one normal seed carries the berry through in an apparently healthy state to ripeness. As far as our experience goes the Clinton and its allies with thin skins are more liable to attack than berries with thicker skins, such as Hartford Prolific and Concord.

THE GRAPE-CANE GALL-CURCULIO, *Madarus vitis*, New Species

(Coleoptera, Curculionidæ.)

The canes of the Concord vine are frequently found to have galls on the last year's growth, in the shape of an elongated knot or swelling which is generally situated immediately above or below a joint. This gall was formed the previous fall while the tender cane was growing, and has almost invariably a longitudinal slit or depression on one side, dividing that side into two cheeks, which generally have a rosy tint. The gall is caused by a little footless, white cylindrical larva which measures 0.28 of an inch, and has a yellowish head, and somewhat darker tawny jaws. It is minutely wrinkled transversely, and sparsely covered with minute white bristles; the three segments next to the head being prominently swollen underneath and the bristles attached to them look very much like legs, and doubtless to some extent perform the functions of legs. This larva indeed bears a very close general resemblance to that of the Potato Stalk-weevil, illustrated at page 93, Figure 37 *a*, and when taken out of its gall immediately curls up as in that figure. During the latter part of June this larva transforms within the cane to a pupa, also greatly resembling that figured at *b*, on page 93, with the exception that it is much smaller, and that the wings and legs reach down three-fourths the length of the body instead of but one-half as in that species. Two weeks after it has thus transformed it becomes a beetle belonging to the great Curculio family. Before this insect had ever been bred to the perfect state I predicted that it would produce a Curculio, as may be seen by referring to page 117 of the Transactions of the Illinois State Horticultural Society for 1867. This beetle is represented enlarged at Figure 74, its natural length being 0.10. It is of a uniform light yellowish-brown without any markings whatever. It is closely allied to the Potato Stalk-weevil, but belongs to the genus *Madarus* which differs from *Baridius* in the peculiar undulating appearance of the wing-cases, and more especially in their being highly polished, the word *Madarus* meaning glossy or polished. This little

[Fig. 74.]



Curculio was considered a new species by Dr. Le Conte, in 1861, and as it has not, so far as I am aware, been described since that time, I subjoin a more complete description of it:

Madarus vitis, N. Sp.—Length, exclusive of rostrum 0.10. Color uniformly rufous, without maculations, the eyes alone being darker. Highly polished; rostrum arcuated, stout and about as long as thorax; thorax and body with extremely minute and distant punctures, anterior margin of thorax abruptly narrowed, especially laterally, into a collar; elytra slightly undulate, with 4 distinct elevations, one on the extreme outer margin close to the thorax, and one on the middle of each, near the extremity.

As an illustration of the great similarity in the habits of insects belonging to the same genus, I will state that there is a small black Curculio, belonging to the genus *Madarus* and differing from this Grape-cane Gall-curculio in no other respect but in color, whose larva lives in a somewhat similar gall found on the common creeper (*Ampelopsis quinquefolia*) which is very closely related to the vine. This black species is also undescribed and is marked *Madarus ampelopsis* in Mr. Walsh's collection.

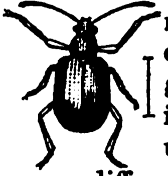
I think it highly probable that the gall of the Grape-cane Curculio is caused more by the punctures which the female beetle makes in depositing her egg, than by the irritations of the larva; for I have found the larva where it had burrowed two and three inches up the cane, away from the gall, without its having caused a corresponding swelling; though this has always been in the one-year-old cane.

Remedy.—If these gall-bearing canes are cut off and burned during the winter there need be little fear of this insect's work, the more especially as it is not secure from parasites, even in its snug retreat, for I have bred a species of *Chalcis* fly from the galls, which had evidently destroyed the true gall-maker.

THE GRAPE-VINE FIDIA—*Fidia viticida*, Walsh.

(Coleoptera, Chrysomelidæ.)

[Fig. 75.]



One of the worst foes to the grape-vine that we have in Missouri is the Grape-vine Fidia which is represented in the annexed Figure 75. It is of a chestnut-brown color, and is densly covered with short and dense whitish hairs which give it a hoary appearance. I have found it very thick in most of the vineyards which I visited, and it is almost universally miscalled the "Rose-bug," which is, however, a very different insect. The Grape-vine Fidia was first described by Mr. Walsh in the May, 1867, number of the *Practical Entomologist*. It is found in the woods on the wild grape-vine and also on the leaves of the *Cercis Canadensis*; but of the tame vines it seems to prefer the Norton's Virginia and Concord. It makes its appearance during the month of June, and by the end of July has generally disappeared, from which fact we may infer that there is but one brood each year. The manner in which it injures the vine is by cutting straight elongated holes of about ⅛ inch in diameter in the leaves, and when numerous it so riddles the leaves as to reduce them to mere shreds. The preparatory stages of this beetle are not yet known.

Remedies.—Luckily this beetle has the same precautionary habit of dropping to the ground, upon the slightest disturbance, as has the Plum curculio, and this habit enables us readily to keep it in check. The most efficient way of doing this is by the aid of chickens. Mr. Peschell, of Hermann, on whose vines this beetle had been exceedingly numerous, raised a large brood of chickens in 1867, and had them so well trained that all he had to do was to start them in the vineyard with a boy in front to shake the vines, and he himself behind the chicks. They picked up every beetle which fell to the ground, and in this manner he kept his vines so clean that he could scarcely find a single beetle in 1868.

THE GRAPE CODLING, *Penthina vitivorana*, Packard.—Plate 2, Figs. 29 and 30.

(Lepidoptera, Tortricidæ.)

Although the preceding insect has been so scarce in 1868, yet the Grape has been worked upon in a somewhat similar manner, and even to a greater extent, by the insect now under consideration. Indeed there is very little doubt that Mr. Walsh, not being acquainted with this insect, confounded its work with that of the Grape-curculio, in some of the instances, of the damage done by this last, which are quoted by him in his report, and this is especially the case in the instance of Mr. M. C. Read of Hudson, Ohio.

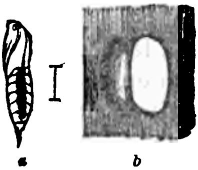
I first received this insect, with an account of its workings, from Huron Burt, of Williamsburg, and subsequently during the month of July, found it universal in the vineyards along the lines of the Pacific and Iron Mountain Railroads. It was found equally common around Alton in Illinois, while Dr. Hull informs me that it ruined 50 per cent. of the grapes around Cleveland, Ohio, the Concord and Ives Seedling being the only varieties which appeared to resist its attacks. It also occurs in Pennsylvania, judging from articles which appeared in the November and December numbers of the *Practical Farmer*. In these numbers my esteemed correspondent, Mr. S. S. Rathvon, of Lancaster, Pennsylvania, gives an account, with description, of some worms which were sent to him by the editors, answering in every respect to this Grape codling. Concluding, from its similarity to the common Apple-worm, that the insect belonged to the genus *Carpocapsa*, he proposed for it the name of *Carpocapsa vitisella*, without having bred the parent moth. In the June number of the *American*

Naturalist (p. 220) is quoted an account of it by Mr. M. C. Read, of Hudson, Ohio, who says that it is "already so abundant there that it is necessary to examine every bunch of ripe grapes, and clip out the infested berries before sending them to the table."

The larva of this Grape-codling may at once be distinguished from that of the Grape curculio, by its having 6 scaly legs near the head, 8 fleshy legs in the middle, and 2 at the extremity of the body, and by spinning a fine web, by which it lets itself drop whenever handled. It is also larger, of a darker color, and bears a very close resemblance to that of the Strawberry leaf-roller, to be hereafter figured and described.

Its presence is soon indicated by a reddish-brown color on that side of the yet green grape which it enters. On opening the grape, a winding channel is seen in the pulp, and a minute white worm with a dark head is seen at the end of the channel. It continues to feed upon the pulp of the fruit, and when it reaches the seeds, eats out their interior. As it matures it becomes darker, being either of an olive-green or dark brown color, with a honey-yellow head, and if one grape is not sufficient it fastens the already ruined grape to an adjoining one by means of silken threads, and proceeds to burrow in it as it did in the first. When full grown it leaves the grape and forms its cocoon on the leaves of the vine. This operation is perormed in a manner essentially characteristic: the worm cuts out a clean oval flap, leaving it hinged on one side, and, rolling this flap over, fastens it to the eaf, and thus forms for itself a cozy little house which it lines on the inside with silk. One of these cocoons is represented at Figure 76, *b*, and though the cut is sometimes less regular than shown in the figure, and I have had them spin up in a silk handkerchief without making any cut at all, it is undoubtedly the normal habit of the insect to make just such a cocoon as represented. In this cocoon, within two days, it changes to a chrysalis, such as is represented at Figure 76, *a*, of a honey-yellow color with a green shade on the abdomen; and in about ten days more the moth makes its escape, the chrysalis having first pushed itself almost entirely out of the cocoon. The moth is of a slaty-brown color with corky-yellow markings, and is represented enlarged at Plate 2, Figure 29, and of the natural size at Figure 30.

[Fig. 76.]



Specimens of this moth were sent by Mr. Walsh to the English Lepidopterist, H. T. Stainton, who could not refer it to any known genus; but Dr. Packard, of Salem, Massachusetts, refers it to *Penthina* a genus very closely allied to *Carpocapsa*, to which our Apple Codling moth belongs. He has also kindly furnished me with advanced sheets of Part V of the "Guide to the Study of Insects," in which (p. 336) he describes and figures it under the name of *Penthina vitivorana*. The description is quite brief, however, and the figure not good, and I therefore subjoin a more detailed description of it in its different stages:

PENTHINA* VITIVORANA, Packard—*Larva.*—Average length 0.35. Largest on segments 10 and 11, tapering thence gradually to the head and suddenly to anus. Color either dark shiny olive-green, glaucous, or brownish. Head and cervical shield honey-yellow, the latter with a darker posterior margin. Piliferous spots scarcely distinguishable. Described from 10 specimens.

Crysalis—0.18—0.20 long. Of normal form. Quite variable in color. Usually of a light honey-yellow, with a green shade on the abdomen, and black eyes, but sometimes entirely dark-green, with light eyes. The chrysalis skin, after the moth has left, is always deep honey-yellow, with the green abdominal mark distinct.

Perfect insect—Average length 0.17; alar expanse 0.37. Head, thorax, palpi and basal half of antennæ fulvous Terminal half of antennæ darker. Legs fulvous, becoming darker on tarsi. Ground-color of fore wings pale slate-blue, with a slight metallic lustre, which becomes lighter and somewhat silvery interiorly and posteriorly. A dark rich-brown band, with a light, somewhat silvery annulation proceeds from the middle of the costa towards the inner margin, becoming paler interiorly; its basal margin being indistinct, but running almost straight across the wing, its outer margin well defined, curving to a rounded point which reaches to the middle of the outer third of the wing and thence running obliquely inwards, nearly to the middle of the inner margin. Beyond this middle band is a large, deep brown, somewhat oval spot, also lighter below than above, and with a pale annulation, which is broken on the outer side above, allowing the spot to extend to the margin of the wing. Above this large spot, at the apex, is a small perfectly round dark spot, with a bright annulation inclining to orange color. The space enclosed by the middle band, and these two spots just described, is brown above, with usually four lighter fulvous costal marks quite distinct, each mark divided at costa by a slight touch of brown. Another somewhat triangular brown spot, with a light annulation above, runs from the posterior angle up between the middle band and large oval spot. The blue space from the middle band to the base of wing is generally brownish near the base, with a brown line across the middle from costa to inner margin, and with two other costal brown marks. The fringes partake of the ground-color. Hind wings slate-brown, darkest near the margins; fringes same color. Body brownish with frequently a clear green tint. The male differs principally in its somewhat smaller size, and especially in the smaller size of the abdomen. Individuals vary greatly.

Described from 5 ♀ and 2 ♂ specimens, all well preserved and fresh.

REMEDIES.—This insect threatens to become a grievous pest unless checked by some unforseen means, as was the case with the Grape curculio. Luckily, there is at least one parasite which attacks it, in the shape of a yellowish, footless maggot, with a green tint and 14 segments. I obtained such maggots from two of the caterpillars, one having crawled out of its host before, and the other after he had spun up. Absence from home prevented my breeding this parasite, but it would doubtless have produced some 4-winged fly belonging to the *Chalcis* family (see Pl. 2, Figs. 6 and 9). According to Mr. Read, the first brood of caterpillars feed on the leaves, appearing in May (in Ohio), or as soon as the leaves are grown. The worms which appear in our grapes in July are, therefore, the second brood, and there is doubtless a third brood, for Mr. Rathvon received them in October, and I have taken the worm out of a grape as late as the 22d of September. The broods, in all probability, run into one another and the last passes the winter within the cocoon, either in the larva or pupa state. They should, therefore, be searched for early in the season on the leaves, The second brood of worms, or those which infest grapes, can easily be espied and destroyed in a healthy vineyard; but where a vineyard

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*Heinemann and Lederer unite the genus *Penthina* with *Grapholitha*, under the latter name, and I believe Mr. C. T. Robinson, of New York, follows them in this respect.

is affected with what Prof. Turner, of Jacksonville, Illinois, designates as the "American Grape rot," the grape attacked by the Codling are not so easily distinguished, as they bear a close resemblance to the rotting ones. Care should be taken in gathering the infested grapes for the worm being very active wriggles away and easily escapes.

THE EIGHT-SPOTTED FORESTER, *Alypia octomaculata*, Fabr.

Pl. 1, Figs. 18 and 19.

(Lepidoptera, Zygænidæ.)

At Plate 1, Figure 19, is represented a caterpillar which has been sent to me by several correspondents with the statement that it was found on their grape vines, and during the month of May, I found the same caterpillar on the vines of Mr. T. R. Skinner, of Cheltenham, and of Mr. Peabody, of Sulphur Springs. It grows to the length of 1¼ inches, and is transversely striped with bluish-white and black, about 4 white and 4 black lines on each segment, with two small black spots in the middle light band on the back. The head and a shield on the first segment are shiny gamboge-yellow, with black dots, and on the 11th segment there is an orange elevation, not shiny and with two black spots in it. From similar caterpillars, which were taken from grape vines in 1865 I bred in the spring of 1866 the moth figured at Plate 1, Figure 18, known as the Eight Spotted Forester (*Alypia octomaculata*, Fabr.) It is recognized at once by its conspicuous markings, being of a black color with orange shanks, each of the fore wings with two large light yellow spots and each of the hind wings with two white spots. The caterpillars leave the vines during the month of June, and descend into the earth where they form for themselves slight cocoons of earth in which they remain through the winter and from which the moth escapes the following April.

It is not probable that this caterpillar which may be called the Blue Caterpillar of the vine, will ever become exceedingly numerous, for it has not been known to become so in the past, and this hasty sketch of its history is given principally for the gratification of the intelligent grape-grower who takes pleasure in thoroughly understanding and knowing, in all their different guises, the creatures he has to deal with.

There are two other caterpillars very much resembling this, which also feed on the vine; but they produce very different looking moths, the one known as *Eudryas grata*, Fabr., and the other as *Eudryas unio*, Hübner. Dr. Fitch in his 3d Report §123 states that the larva of *E. grata* differs only from that of *A. octomaculata* in lacking a white spot on each side of every segment, and in being slightly humped at its hind end. The specimen from which my figure was made may prove to be *E. grata*, for it had no such white spots and *was* humped; but it differs essentially from the most excellent description of this last larva which A. S. Packard, Jr., has given in his "notes on the family Zygænidæ, pp. 27–29, and sufficiently resembles those from which I actually bred the 8-spotted Forester.

THE GRAPE-VINE PLUME, *Pterophorus periscelidactylus*, Fitch.

Plate 2, Figs. 15 and 16.

(Lepidoptera, Alucitidæ.)

During the latter part of May and beginning of June, the leaves of the grape-vine may often be seen drawn together by silken threads and in the retreat thus made will be found a small hairy caterpillar which feeds on the tender leaves of the vine. This caterpillar grows to the length of about half an inch; the color of the body is very pale green and has four elevated white spots and two still smaller dots on every segment, from which spring stiff white hairs in all directions.

This caterpillar was quite common last summer in many sections of the State. It was first named by Dr. Fitch, who found it on the vine in the State of New York. A number which I brought home changed to chrysalids during the first days of June, and the moths were produced from them in about 8 days afterwards. The worm first spins a few threads of silk to the underside of a leaf, or other object, and the chrysalis attaches the lower part of the terminal segments to them, and hangs with the tail somewhat curved, at a slant of 40° from the object, as represented at Plate 2, Figure 16. This chrysalis measures 0.35—0.40 in length, is of a light-green color and of peculiar form. It is ridged, with remnants of the tubercles of the caterpillar. It is angular and cut off slantingly and bluntly at the head, but is characterised principally by two sharp and angulated projections from the middle of the back, and which are enlarged under the figure 16, in Plate 2.*

The moth (Pl. 2, Fig. 15) is of a tawny yellow color, the wings marked with white and with a darker shade. The caterpillars disappear very suddenly, for the chrysalis is so small and so nearly the color of the leaf, that it would be seldom noticed, even it were not so well hidden. There are probably two broods in the year, though I failed to find any trace of them after the first had disappeared.

All the moths of the family (ALUCITIDÆ) to which this belongs have very appopriately received the name of Plumes. In the genus *Pterophorus* the fore wings are divided into two and the hind wings into three lobes, and to show how very different insects may be in the larva state, both in habit and appearance, even when they belong to the same genus and greatly resemble each other in the perfect state, I have represented at Plate 2, Figure 13, another Plume, which I shall presently describe as the Thistle Plume.

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*Dr. Fitch has given a most excellent and full description of this chrysalis in his 1st Report pp. 140–141.

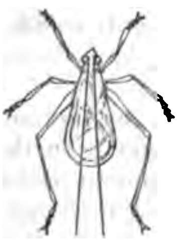
Remedies.—Whenever they become numerous, as they did last summer, the only remedy is hand-picking.

THE TREE-CRICKET—*Œcanthus niveus*, Harris.

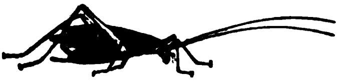
(Orthoptera, Achetidæ.)

This insect is represented in the annexed cuts, Figure 77 showing the male, and Figure 78 the female. The general color is a delicate greenish, semi-transparent white, though some specimens have a blackish shade. From the fact that it is known to devour plant-lice and likewise the eggs of some moths, I was formerly in doubts whether it should be considered friend or foe, but the experience of the past year settles the matter definitely, for it has proved very destructive to the vine. The female deposits her eggs in grape canes, raspberry and blackberry canes, in the twigs of the peach, White willow, and a variety of other trees. In depositing, she makes a straight, longitudinal, contiguous row of punctures, each puncture about the size of that which would be made by an ordinary pin. From each of these holes, a narrow, yellowish, elongate egg, runs slantingly across the pith. The twigs or canes thus punctured almost invariably die above the punctured part, and the injury thus caused to vines is sometimes considerable.

[Fig. 77.]



[Fig. 78.]



But by far the worst habit of the Tree-cricket is that of severing grapes from the bunches just as they are beginning to ripen, and it sometimes cuts off an entire bunch, or so thoroughly excoriates the stem that it fails to ripen its berries. I have seen the ground under some vines covered with grapes which had been thus severed, but should never have accused the Tree-cricket, had I not found it in the very act, and received specimens with accounts of this same habit, both from Mr. B. L. Kingsbury, of Alton, Illinois, and from J. H. Tice, of St. Louis. This cricket is aided in this destructive work by another species which has the same habit, namely the Jumping Tree-cricket (*Orocharis saltator*, Uhler.) This last insect is more robustly built than the former, and is at once distinguished by its uniform light-brown color, and I have good reason to believe that it deposits its eggs in the grape-vine in a row of punctures, each of which is about one-third of an inch apart, and each of which leads to from ten to twelve narrow eggs, about a tenth of an inch long, and deposited on either side of the puncture, length-wise in the pith.

REMEDY.—The crickets themselves should be crushed whenever met with, while the vineyardist should make a business of searching in the winter time for all punctured twigs, and by burning them, prevent their increase in future.

THE RASPBERRY GEOMETER, *Aplodes rubivora*, N. Sp.—Pl. 2, Figure 25.

(Lepidoptera Geometridæ.)

The lovers of those most exquisite fruits, the Raspberry and the Blackberry are often greatly disgusted by the discovery of the fact that instead of the delicious berry which they expected to enjoy, they are munching the small caterpillar now under consideration. This caterpillar was quite numerous last summer on both the above named fruits at South Pass, Illinois. It has the peculiar faculty of thoroughly disguising itself with pieces of dried berry, seed, pollen, and other *debris* of the fruit, which it sticks to a series of prickles with which it is furnished. Add to this disguise the habit which it has of looping itself into a small ball, and it almost defies detection. It is most numerous during the months of June and July. Through the kindness of Mr. T. A. E. Holcomb, of South Pass, I was enabled to breed this insect to the perfect state. From two specimens of the larvæ which he sent me, I bred from one, July 9th, the little moth which is illustrated at Plate 2, Figure 25, the other being infested with a parasite which formed a tough cocoon, very much like that of a parasitic fly (*Campoplex fugitivus*, Say), which I have bred from milkweed feeding larvæ of *Euchœtus egle*, Harris. This little moth is of a delicate light grass-green color, with two paler lines running across both wings as in the figure. It belongs to the genus *Aplodes*, and as I am informed by Dr Packard, comes very near to *glaucaria* Guénée, and has not hitherto been described. In the proceedings of the Boston Society of Natural History (Vol. IX, pp. 300-2) Mr. Walsh has described an oak-feeding Geometer which closely resembles this, both in the larva and perfect states. He erected the new genus *Hipparchiscus*, for it and gave it the specific name *venustus*. It is a much larger insect, and differs in sundry respects from the species under consideration, though the moth is of the same color and somewhat similarly marked.

APLODES RUBIVORA, N. Sp. -*Larva*—Average length 0.80. Color light yellowish-gray, darker just behind each joint, and very minutely shagreened all over. On each segment a prominent pointed straight projection each side of dorsum, and several minor warts and prickles below. Two very slightly raised, longitudinal lighter lines along dorsum, between the prominent prickles. Ten legs.

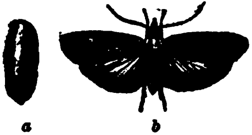
Perfect insect—Alar expanse 0.50; length of body 0.25. Color verdigris-green, the scales being sparse so that the wings appear sub-hyaline. Fore-wings with two transverse lighter lines dividing the wing into three parts, proportionate in width as 3, 4, 2 counting from base, and parallel with posterior margin; also a faint line between these two, running to about ½ of wing from costa. Hind wings with two similar transverse lines, dividing the wing in like proportion, the outer line not parallel with margin, but wavy and produced posteriorly near its middle. Costa pale; fringes obsolete. Head, thorax and abdomen green above, but, together with antennæ and palpi, white beneath.

Described from one ♀ specimen.

THE GOOSEBERRY FRUIT-WORM, *Pempelia grossulariæ*, Packard.—Pl. 2, Fig. 17.

(Lepidoptera, Phycidæ).

[Fig. 79.]



On June 8th, I received from Mr. Geo. H. Cherry of Hematite, a number of diseased gooseberries, with an account of their prematurely turning red and rotting. The cause was a smooth thick glass-green worm which is more fully described below. Subsequently on the 12th of the same month, I received the same species of worm with a similar account of its work, from Mr. Stephen Blanchard, of Oregon; on the 16th from Jos. F. Bryant, of Bethany, with the statement that it was "feeding on and hollowing out" his currants, and on the 17th from Dr. W. A. Monroe of Bloomington with the statement that it was destroying his native gooseberries and Green gage plums. Mr. A. Fendler and F. R. Allen, both of Allenton, likewise informed me that it entirely ruined their currant crop, and I afterwards found the same insect on the currants and gooseberries wherever I went, and it doubtless occurs over the whole country, for as we shall presently see, it attacks the gooseberry both in the State of New York, Massachusetts, and in Canada.

Dr. Fitch, in his 3d Report, §149, makes brief mention of it though he was not acquainted with the parent moth. He concludes his account in the following words: "I have sometimes seen bushes of the wild gooseberry with every berry withered and reduced to a mere dry hollow shell, with a cob-web-like tube protuding from the orifice in one side. And the present summer a letter to the *County Gentleman*, from E. Graves Jr. of Ashfield, Mass., states that for three years past, his 'Houghton's seedling' gooseberries have been a total failure from this same worm, as I am assured by the account which he gives of it and the specimens accompanying his letter."

As soon as gooseberries and currants are well formed, this worm begins to make its presence known by causing the berries which it infests to prematurely turn red or dull whitish. After eating the inside of one berry, leaving a hole for the passage of the excrement, it enters another berry, making a passage way of silk, until it draws together a bunch of currants, or two or three gooseberries as the case may be. The berries thus attacked sometimes drop, but more generally the hollow shell mixed with cob-web-like silk shrivels up and hangs on to the bushes. During the latter part of June the worms descend from the shrub and spin for themselves brown cocoons (Fig. 79, *a*) in the leaves and rubbish on the ground. Here they change to brown chrysalids and remain in this state through the winter and come forth in the spring as moths. Thus there is but one brood of this insect each year, and yet by the middle of July there is never a worm to be found, and the chrysalis consequently remains quiescent alike through the hottest summer and the coldest winter weather. As the worms which I procured are still in the chrysalis state, I should have been unable to present the complete history of this pest, in this my first report, had it not been for the kindness of Mr. William Saunders of London, Canada, whom I met in Chicago, at the meeting of the "American Association for the Advancement of Science," and who very fortunately had with him specimens of the moth which he had bred from gooseberry-feeding worms, found in Canada, the description of which answered exactly to those of mine. But to make doubly sure that the insect which Mr. Saunders bred, is the same species as ours, I purposely forced one of my chrysalids. On the 25th of January, 1869, the markings of the wings showed through the chysalis skin, which was loose and brittle. These signs indicated that the forthcoming moth was in an advanced state of development, and on carefully taking away the chrysalis skin, it lay before me with nothing lacking to bring it to perfection but the inflating of the wings. Their markings were however perfect and distinct and agreed entirely with the Canadian specimen.

This moth is represented at Figure 79, *b* and still more faithfully at Plate 2, Figure 17, its general color being pale gray. It belongs to the genus *Pempelia*, and from advance sheets of Dr. Packard's "Guide" I learn that he has named it *P. grossulariæ*, and it may be known in English as the Gooseberry Pempelia.

REMEDIES.—Care should be taken to gather and destroy the worms while they are yet in the fruit, as they are afterwards found in the chrysalis state with great difficulty. If chickens are allowed to run amongst the bushes after the fruit has gone, they will materially assist in checking it by devouring such chrysalids as are within their reach.

PEMPELIA GROSSULARIÆ, Packard—*Larva*—Average length 0.65; thickest in the middle of body, tapering thence slightly each way. Color glass-green, partly translucent, shiny, and with a roseate hue on the upper surface. Head of a light gamboge-yellow, with tawny lips. Cervical shield not very prominent and of the same color. No other markings whatever. A few very fine white hairs, especially near the head and tail. 16 legs, the thoracic ones the same color as head, the others green.

Described from 10 specimens.

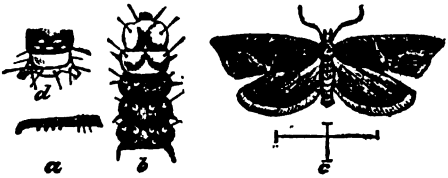
Chrysalis—Length 0.38. Of the normal form, and dull mahogany-brown color. The spiracles appearing like small tubercles and the extremity furnished with several stiff rufous curled bristles.

Perfect insect.—Length, including palpi, 0.40; alar expanse, 0.80. Color pale-gray. Front wings with a dark transverse diffuse band on the inner third, enclosing a zig-zag white line not reaching the costa. A dark discal spot, constricted in the middle, the upper and lower edges continued basally in the shape of two faint lines to the transverse band already mentioned, where they almost converge, the space enclosed by them being whiter than the rest of the wing, with a darker line along the middle. Beyond this discal spot, at about the outer fourth of the wing is another dark but less distinct diffuse transverse band, nearly parallel with posterior margin and with a white zig-zag line produced into an acute angle, basally, on the internal margin, the space between this band and the discal spot being also quite light. A row of marginal black dots, with the apex light. Fringes concolorous. Hind wings somewhat more dusky with darker margins and veins and lighter fringes. Head, thorax, abdomen, antennæ, palpi and legs all pale gray, being more silvery on the under than on the upper side.

One specimen from Wm. Saunders.

THE STRAWBERRY LEAF-ROLLER, *Anchylopera fragariæ*, Walsh and Riley—Pl. 2, Figs. 26 and 27.

[Fig. 80.]



The above figure represents an insect which devours the leaves of our strawberries. A more perfect picture of the moth is given enlarged at Plate 2, Figure 26, and of the natural size at Figure 27. It was first described in the January number of the *American Entomologist*, from which I take the following account of it.

For nearly two years, we have been acquainted with a little greenish leaf-roller, measuring about one-third of an inch, (Fig. 80, *a*), which in certain parts of North Illinois and Indiana, has been ruining the strawberry fields in a most wholesale manner; and which also occurs in Canada, judging from an account in the *Canada Farmer* of August 1, 1867. It crumples and folds the leaves, feeding on their pulpy substance, and causing them to appear dry and seared, and most usually lines the inside of the fold with silk. There are two broods of this leaf-roller during the year, and the worms of the first brood, which appear during the month of June, change to the pupa state within the rolled-up leaf, and become minute reddish-brown moths (Fig. 80 *c*) during the fore part of July. After pairing in the usual manner, the females deposit their eggs on the plants, from which eggs in due time, hatches a second brood of worms. These last come to their growth towards the end of September, and changing to pupæ, pass the winter in that state.

We first heard of this leaf-roller in the summer of 1866, when it did considerable damage at Valparaiso, Indiana, and we were informed by Mr. N. R. Strong, of that place, that in 1867 they continued their depredations with him, and destroyed 10 acres so completely as not to leave plants enough to set half an acre, and that in consequence of this little pest in conjunction with the White-grub, he has had to abandon strawberry culture.

When we met the *ad interim* committee of the Illinois State Horticultural Society at Lacon, in the beginning of July, 1868, we received from these gentlemen a quantity of infested strawberry leaves, from which in the course of the next two or three weeks we bred many of the moths. These specimens had been collected at Mr. Bubaugh's place, near Princeton, Illinois, where they were said to be very abundant, and to have completely destroyed one strawberry patch containing several acres.

Subsequently we received another lot of specimens from Mr. W. E. Lukens, of Sterling, Whiteside, county, Illinois, with the following remarks upon this very important subject:

"Where these insects are thick I would never think of raising strawberries. It is strange that I have not noticed any of their work upon this side the river; while on the south side for a mile up and down they are ruining the crops of berries. Removing the plants does not take with them the moth nor the eggs, so far as has been observed. A gentleman by the name of Kimball, at Prophetstown, had his crop a few years ago entirely destroyed by this insect, though it amounted in all to two or three acres. I hear of a great many men in other places having their crops burnt up with the sun, and have no doubt that it was this leaf-roller, and not the sun, that was the real author of the damage. As for myself, I have on this account entirely quit the business of growing strawberries."

The only modes of fighting this new and very destructive foe of the strawberry—which, however, seems to be confined to northerly regions—are, first, to plough up either in the spring or in the fall, such patches as are badly infested by it, by which means the pupæ will probably be buried and destroyed; and second, not to procure any plants from an infested region, so as to run the risk of introducing the plague upon your own farm.

We annex brief descriptions of this insect, both in the perfect and larval states. We are indebted to the distinguished English Microlepidopterist, H. T. Stainton, for the generic determination of the species, and for the further remark that "it is closely allied to the European *Anchylopera comptana* (Manual Vol. II, p. 225), which feeds on various Rosaceæ, such as *Poterium sanguisorba*, *Potentilla verna*, and *Dryas octopetala*."

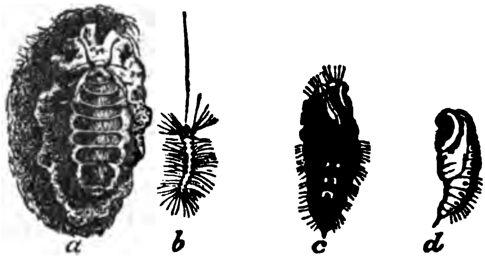
ANCHYLOPERA FRAGARIÆ, New species—Head and thorax reddish-brown. Palpi and legs paler. Antennæ dusky. Tarsal joints tipped with dusky. Front wings reddish-brown, streaked and spotted with black and white as in the figure. Hind wings and abdomen dusky. Alar expanse 0.40–0.45 inch. Described from nine specimens.

The Larva measures, when full grown, 0.35 of an inch. Largest on the first segment tapering thence very slightly to the last. Color varying from very light yellowish-brown to dark olive-green or brown. Body soft, somewhat translucent, without polish; the piliferous spots quite large, shining, always light in color, contrasting strongly in the dark specimens with the ground color. Hairs, especially lateral ones, quite stout and stiff. Spots arranged in the normal form, segments 2 and 3 having none, however, on their posterior half as have the rest (See Fig. 80, *b*) Head horizontal, of a shining fulvous color, with a more or less distinct dark eye-spot and tawny upper lip. Cervical shield of the same shiny appearance. Anal segment with two black spots (See Fig. 80, *d*) at posterior edge, being confluent and forming an entire black edge in some specimens. Legs, prolegs, and venter of the same color as the body above.

THE WHITE-MARKED TUSSOCK MOTH—*Orgyia leucostigma*, Sm. & Abbott.

(*Lepidoptera*, Arctiidæ.)

[Fig. 81.]

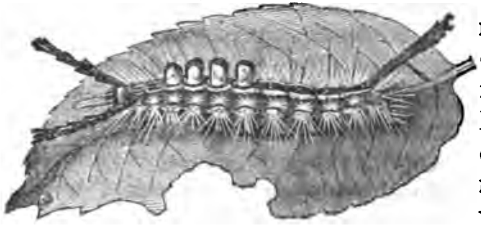


During the winter little bunches of dead leaves are sometimes found to be quite numerous on our apple trees. They are generally fastened to the twigs, and upon examination are found to contain gray cocoons. The greater portion of these cocoons have an egg-mass glued to them, which is composed of numerous perfectly round, cream-colored eggs, of about 0.03 diameter, and partly covered with glistening white froth-like matter; while the other proportion of these cocoons have no such egg-mass.

About the middle of the month of May these eggs begin to hatch, and continue thus to hatch in different parts of the orchard for over a month. The young caterpillar which hatches from these eggs is represented at Figure 81, *b*. It at first measures 0.10 in length, and is of a dull, whitish-gray color with the underside paler or of a dirty white, and with the tufts on the back of a dark brown. In two days after hatching, orange spots commence to appear along the back, and especially on segments 2, 3, 8 and 9. On the seventh day after having remained stationary for about two days, fastened to some part of the tree with silk, it casts its skin for the first time, after which operation the hairs are more numerous, the dark portions more intensely black, the orange parts of a brighter orange and the two tufts near the head longer. As it approaches the time of the second moult, the underside becomes more glaucous, a yellow line begins to appear at the sides, and in some cases the orange marks become yellow, with the exception of a small, perfectly round spot on segments 9 and 10 which always remains orange; the neck or first segment, where it joins the head, also becomes orange or yellow. Six days from the time of the first moult the second moult takes place, the worm having become lighter colored each day. Immediately after the shedding of the second skin it measures 0.30; the collar is more intensely orange as well as the head, while four cream-colored tufts appear on the back of segments 4, 5, 6 and 7, and the two round spots on segments 9 and 10 are of a very bright scarlet-orange. As it grows and approaches the third moult, the orange collar becomes more conspicuous, the back becomes of a perfect velvety black; the cream-colored tufts become smaller, whiter, and the fourth frequently obsolete; a transverse row of four yellow warts becomes conspicuous on segments 2 and 3; a subdorsal yellowish line appears, starting from segment 8 and running and diminishing posteriorly; the upper sides become of a dark bluish-gray, while the yellow line along the lower sides becomes more distinct. Six days after the second moult the third moult takes place with but little change in the appearance of the caterpillar, further than that the different colors become still more bright and distinct and the different tufts still larger.

Up to this time all the individuals of a brood have been alike, and of a size, so that it was impossible to distinguish the sexes. Six days from the third moult, however, the males measure not quite ¾ of an inch, and begin to spin their cocoons; while the females undergo a fourth moult about this time, and in about six days more they also spin up, having acquired twice the size of the male when he spun up.

[Fig. 82.]



The annexed Figure 82 represents the full grown female caterpillar, it differing from the full grown male only in its larger size. At this stage of its existence the caterpillar is a most beautiful object, with its vermillion-red head and collar, its cream-colored brushes and its long black plumes.

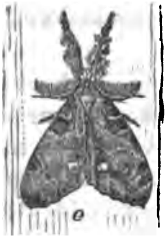
When young these caterpillars make free use of a fine web which they spin, and by which they let themselves down when disturbed, and it is quite amusing to watch them ascend again whenever they have become sufficiently assured that there is no danger. They perform this feat with the thoracic legs, using those of each side alternately, the body and head being thrown from side to side in harmony, very much as a sailor climbs a rope "hand over hand."

It may puzzle some persons to divine how such a hairy and tufted caterpillar can possibly cast off its skin and yet retain these pretty appendages. After having remained stationary without food for about two days, the old skin becomes dry and somewhat loose. If at this time this old skin be carefully removed. it will be found that an entirely new set of these appendages has been forming underneath it; the two long plumes curled over the head, down by the feet and up again to near the scaly collar; the four white brushes folded close together inwardly crossing each other; the anal plume folded below the anus, and all the other hairs laid in thread-like bunches close to the body in a posterior direction. In due time the old skin splits on the back, near the head, and the caterpillar gradually works it off posteriorly. The moment they are exposed the appendages which had been compressed, as described, to the body, commence to straighten out, and in a few minutes the new dress is displayed in all its beauty and freshness. The long plumes at the head do not straighten out of their own accord, however, for the caterpillar by a curious curling of the body, while resting on a few of its abdominal prolegs, cunningly brushes them with its tail end, first on one side, then on the other. It furthermore presses them, for the same end, one after the other against any surface on which it is at the time walking, and having once thoroughly straightened out its toilet it rests a few minutes from its efforts and then commences to feed with surprising vigor, apparently determined to make up for its two day's fast.

The male cocoon is white or yellowish, and sufficiently thin to show the insect within it. It is formed of two layers, the outer one having the tufts and plumes which adorned the maker, scattered through it. The female cocoon is twice as large and more solid and dense.

Soon after completing his cocoon the male changes to a chrysalis, which is represented of the natural size at Figure 81, *d*. The female, in due time, changes to a very different chrysalis, which is also represented life-size at Figure 81, *c*. In about two weeks after spinning up, the moths begin to issue. In this state the sexes are still more dissimilar. The male produces a winged moth, which is represented at Figure 83, while the female is furnished with but the merest rudiments of wings, and is destined to simply crawl to the outside of her cocoon, where, after the male has met her, she deposits her eggs, gluing and protecting them with the white frothy matter already described, which, at this time, has every appearance of spittle. She is faithfully represented at Figure 81, *a*, and after depositing her eggs, the body greatly contracts and she soon dies.

Fig. 83.



Such is an outline of the natural history of this pretty, but destructive caterpillar. In our State there are two broods each year, the moths of the first brood appearing during the latter part of May and fore part of June, and those of the second brood in September and October. The periods given for the transformations are average periods, and in further illustration of the difficulty in drawing rigid lines of time, in the development of insects, I will state that from a hundred larvæ which hatch out in a single day, some will have produced moths while others are yet feeding in the caterpillar state.

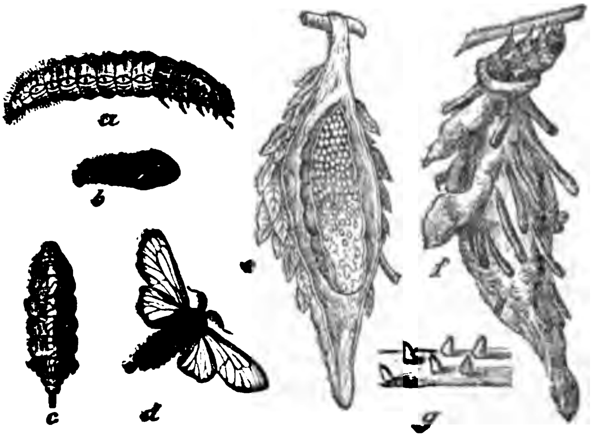
This insect seems to occur more or less over the whole country, and I have repeatedly received its egg-masses during the past two winters. It is, however, as we might expect from its nature, often confined like the Canker-worm, to particular orchards in a particular neighborhood. It feeds upon different kinds of trees, such as the elm, maple, horse-chestnut and oak, but it seems to prefer the apple, the plum, the rose and the pear.

REMEDIES.—Dr. Fitch has described two parasites, which attack this caterpillar, and I am acquainted with seven others, making in all nine distinct parasites, which prey upon this species. It was my intention to have described and figured some of these parasites, but the time in which this Report must be ready for the Public Printer forbids my doing so, the present year, and it suffices to say that in collecting the cocoons in the winter in order to destroy them, *none but those which have the egg-masses on them should be taken, as all the others, either contain the empty male chrysalis or else some friendly parasite!* From the fact that the female never travels beyond her cocoon, it becomes obvious that, since the insect can only travel in the caterpillar state, it would require over a century for it to spread even a hundred miles. Hence we may rightly conclude that it has been introduced to different parts of the country in the egg-state on young imported trees. How essential it is then to examine every tree in planting out a young orchard, and how easy it is with the proper precautions to forever keep an orchard free from its destructive work. As already stated, the young worms let themselves down upon slightly jarring the tree, and though after the third moult they lose this habit to a great extent, yet they may always be brought down by a good thorough shake, and where they have once invaded an orchard, this will be found the most feasible mode of killing them; though *prevention* by destroying the egg-masses in the winter when they are easily discerned, is infinitely the best and surest remedy against its attacks.

THE BAG-WORM, *alias* BASKET-WORM, *alias* DROP-WORM—*Thyridopteryx ephemeræformis*, Haworth.

(Lepidoptera, Psychidæ.

[Fig. 84]



Our shade and ornamental trees are often defoliated by various insects, and I will give brief accounts of three which have attracted my attention during the past summer. Of these, the insect whose transformations are illustrated above, is by far the most common and injurious. It apparently flourishes better south of latitude 39° than north of that line. It occurs on Long Island, and in different localities in Pennsylvania, Ohio, Maryland, District of Columbia, the Carolinas, Georgia, Alabama, Kentucky, South Illinois and in the southern half of our own State, and doubtless in some of the other States, though I have no records to judge by. In St. Louis county it is very plentiful. Year after year shade trees are planted along the streets and avenues of this city, and year after year a great proportion of them dwindle and die, until at last the opinion very generally prevails among land-owners that it is of little use to try and grow them. Consequently they are not as generally planted as they should be, and St. Louis, with all her natural advantages, lacks to a great extent, those beautiful vistas and long rows of trees which so characterize and adorn some of our more Eastern cities.

Why is it that so many of these trees dwindle? No one seems to know! Can it be owing to the character of the soil, or of the climate? Most emphatically, no!—in these respects there is no more favored city on the continent, and for the proof we need only to visit Mr. Shaw's beautiful gardens, or Lafayette Park, or any of the nurseries around the city. What then, is the cause? Why, the very Bag-worm which forms the subject of this article. It swarms all over the city proper, but decreases in numbers, as a general rule, as one approaches or gets beyond the limits, and is comparatively rare in the above mentioned places. The reason for this is obvious when we understand its history, for it can spread but gradually, and has naturally multiplied most in those places where it has longest existed—namely, in the older parts of the town.

The natural history of the insect is interesting, and may be thus briefly given:

Thoughout the winter the weather-beaten bags may be seen hanging from almost every kind of tree. Upon plucking them many will be found empty, but the greater proportion of them will, on being cut open, present the appearance given at Figure 84, *e*; they are in fact full of soft yellow eggs. Those which do not contain eggs are the male bags and his empty chrysalis skin is generally found protruding from the lower end. About the middle of next May these eggs will hatch into active little worms, which, from the first moment of their lives, commence to form for themselves little bags. They crawl on to a tender leaf, and, attached to their anterior feet with their tails hoisted in the air, they each spin around themselves a ring of silk, to which they soon fasten bits of leaf. They continue adding to the lower edge of the ring, pushing it up as it increases in width, till it reaches the tail and forms a sort of cone, as represented at Figure 84, *g*. As the worms grow, they continue to increase their bags from the bottom, until the latter become so large and heavy that the worms let them hang instead of holding them upright, as they did while they were young. By the end of July they have become full grown, when they present the appearance of Figure 84, *f.* The worm on being pulled out, appearing as at Figure 84, *a.* This full grown condition is not attained, however, without critical periods. At four different times during their growth these worms close up the mouths of their bags and retire for two days to cast their skins or moult, as is the nature of their kind, and they push their old skins through a passage which is always left open at the extremity of the bag, and which also allows the passage of the excrement.

During their growth they are very slow travelers and seldom leave the tree on which they were born, but when full grown they become quite restless, and it is at this time that they do all their traveling, dropping on to persons by their silken threads and crossing the sidewalks in all directions. A wise instinct urges them to do this, for did they remain on one tree, they would soon multiply beyond the power of that tree to sustain them, and would in consequence become extinct. When they have lost their migratory desires, they fasten their bags very securely by a strong band of silk to the twigs of the tree on which they happen to be. A strange instinct leads them to thus fasten their cocoons to the *twigs* only of the trees they inhabit, so that these cocoons will remain secure through the winter, and not to the leaf-stalk where they would be blown down with the leaf.* After thus fastening their bags, they line them with a good thickness of the same material, and resting awhile from their labors, at last cast their skins and become chrysalids. Hitherto the worms had all been alike, but now the sexes are distinguishable, the male chrysalis (Fig. 84, *b*) being but half the size of the female chryalis (shown inside of the bag at *e*). Three weeks afterwards a still greater change takes place, the sexes differentiating still more. The male chysalis works himself down to the end of his bag and, hanging half-way out, the skin bursts and the moth (Fig. 84, *d*) with a black body and glassy wings escapes. and when his wings are dry, soars through the air to seek his mate.— She never leaves her case, but issues from her chrysalis in the shape of an abortive, footless and wingless affair (Fig. 84, *c*) and after copulating, works herself back into the chrysalis skin, fills its upper but posterior end with eggs and stops up the other end with what little there is left of her body when she gets through. These eggs which are quite soft and yellowish, pass the winter protected in the bags, and produce young worms again the following spring, which go through the same cycle of transformations thus hurriedly described.

This insect is essentially polyphagous, for it occurs alike on evergreen and deciduous trees. I have found it on the elms, the common and the honey locusts, Lombardy poplar, catalpa, Norway spruce, arbor-vitæ, Osage orange, soft and silver maples, sycamore, apple, plum, cherry, quince, pear, linden, and above all on the red cedar, while Mr. Glover has also found it on the cotton plant in Georgia. It is also exceedingly hardy and ruddy, and the young worms will make their bags of almost any substance upon which they happen to rest when newly hatched. Thus they will construct them of leather, paper, straw, etc., etc., and it is quite amusing to watch their operations.

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*I have noticed that the Ailanthus tree is almost entirely exempt from the attacks of this worm, but cannot yet tell whether this is because the leaves are repulsive to it, or whether, the leaves being compound, the worm's instinct fails it, in that it fastens its case to the mid-stalk, which falls and carries the case with it to the ground. I incline to the latter belief however, from the fact that the insect is such a general feeder, and that a few isolated cases are sometimes seen attached even to Ailanthus twigs, showing that they can feed and mature on this tree.

NATURAL REMEDIES.—The only parasite which has been hitherto known to attack this Bag-worm is one known as *Cryptus inquisitor*, Say, which Mr. Glover figures on Plate 11, Figure 5, of his yet unpublished plates of four-winged flies. Last September, through the kindness of Miss M. E. Murtfeldt of St. Louis, I discovered another parasite which lives in the body of the worm to the number of five or six at a time, and which after destroying their victim, spin for themselves tough white silken cocoons within the bag, as represented at Plate 2, Figure 10. The Ichneumon fly which issues from these cocoons has never been described, and as the sexes differ remarkably, I subjoin a full description of each. The female is represented at Plate 2, Figure 11, and the male at Figure 12, and it will be seen at once that while the wings of the former are clouded, those of the latter are perfectly clear. This fly belongs evidently to the genus *Hemiteles* though it differs from most species in having the areolet wanting.

HEMITELES (?) THYRIDOPTERYX, N. Sp.—♀ Length, 0.36; expanse 0.50. Ferruginous, opaque. Head transverse, rather broader than thorax, the front much depressed; face prominent centrally beneath antennæ, closely punctured, thinly clothed with pale pubescence; clypeus and cheeks shining; tips of mandibles black; antennæ, long, slender, filiform, ferruginous, blackish at tips; thorax rugose; scutellum prominent, with sharp lateral margins; metathorax prominent, quadrate, abrupt laterally and posteriorly, finely reticulated and pubescent, the upper posterior angles produced on each side into a long, divergent, flattened, subacute spine; disk with two longitudinal carinæ, from which diverges a central transverse carina; tegulæ piceous; wings hyaline, subiridescent; a narrow, dark fuliginous band crosses the anterior pair a little before the middle, and a broad band of same color between middle and apex, this band having a median transverse hyaline streak; areolet wanting, second recurrent nervure straight, slightly oblique; apex of posterior wing fuscous; legs long and slender, ferruginous, more or less varied with fuscous; posterior coxae, tips of their femora, and their tibiæ and tarsi, fuscous; base of four posterior tibiæ more or less whitish, forming a rather broad annulus on posterior pair; abdomen petiolated, subconvex, densely and finely sculptured, blackish, basal segment tinged with reddish, the second and third segments distinctly margined at tip with whitish; apical segments smooth and shining, thinly pubescent; ovipositor half as long as abdomen, sheaths blackish.

♂.—Not at all like the ♀. Length 0.33, expanse 0.44. Long, slender, black, polished, without distinct punctures, thinly clothed with white pubescence; palpi white; antennæ long, slender; scape reddish; mesothorax gibbous, with two deeply impressed longitudinal lines; metathorax with well-defined elevated lines, forming several irregular areas; sides rugulose, apex without spines or tubercles; tegulæ white; wings whitish-hyaline, subiridescent, the nervures and stigma white, subhyaline, neuration as in ♀; legs long, slender, pale honey-yellow; coxæ, posterior trochanters, apex of their femora, and their tibiæ and tarsi, blackish; base of posterior tibiæ with a white annulus; abdomen long, slender, flattened, petiolated, smooth and polished, the apical margin of second segment being narrowly whitish.

Described from four ♀ and one ♂ specimens bred from the same cocoon.

Artificial Remedies.—From the natural history of this Bag-worm it becomes obvious, that by plucking the cases in the winter time, and burning them, you can effectually rid your trees of them, and I advise all who desire healthy trees to do this before the buds begin to burst in the spring. Where this is not done the worms will continue to increase, and partly defoliating the tree each year, slowly, but surely, sap its life.

In conversation some time since with Mr. Edward Cook, who is superintending the improvements in Washington Park, St. Louis, I showed him that every one of the young trees that had been lately planted there had from six to a dozen of these Bag-worms hanging from their twigs. I explained to him that the trees would never thrive with these parasites, and that, prevention being easier than cure, he had better have them plucked off at once, while they were within reach. He informed me afterwards that he had gathered two barrels full from these trees, but there are many yet left, which should be removed before spring.

THE AILANTHUS WORM—Larva of *Œta compta*, Clem., Plate 2, Figs. 22 and 23.

(Lepidoptera, Tineidæ.)

The Ailanthus is highly prized in most of our cities as a shade tree, and though there certainly are other trees as quick growing, and as hardy, which might advantageously take its place, yet as it has an almost perfect immunity from the attacks of the Bag-worm and continues to be grown, it will be of interest to know what insect enemies it has. Fortunately it has very few, but every St. Louisan must have noticed last fall that nearly all the young Ailanthus trees around the city, and in the parks, looked black and seared as though they had been scorched by fire. Few probably divined the cause of this phenomenon, but it was the work of the worm which is the subject of this chapter.

This worm is slender and of a very dark olive-brown color, with white longitudinal lines. During the months of August and September it may be found of all sizes, living in communities of from five to thirty individuals within a slight silken web. Did they but feed on the leaves their injury to the tree would be slight, but they have the miserable habit of gnawing the leaf stalk in two, and of severing the leaf, and causing it to turn black; thus marring the looks of large trees and killing many seedlings outright. When the worm is full grown it suspends itself in the middle of the loose web and changes to a chrysalis about ½ inch long and of a dull smoky-brown color. The chrysalis skin is so very fine, that as the future moth develops within, the colors of its wings show distinctly through it. The chrysalis state lasts on an average about two weeks, at the end of which time the moth bursts forth. In this state it is one of the neatest and most beautiful little moths that can well be imagined. At Plate 2, Figure 22, it is represented of the natural size, expanded, and at Figure 23 with the wings closed. The fore wings are of a bright metallic golden-orange, crossed transversely with bands of very pale chrome-yellow, marbled with black; while the underwings are smoky black, and almost transparent in the middle. The first moths begin to appear during the first days of September, and continue issuing from the crysalids till the last of October. From the fact that I could get none of them to deposit eggs, I infer that they pass the winter in the moth state—the more readily since I have had them escape from the crysalis even in November. They are very fond of flitting over and clinging to the flowers of the Golden rod and of the *Eupatorium serotinum.*

This insect probably occurs throughout the Southern States, for Mr. Glover has found it in Georgia. It is doubtless confined to the *Ailanthus* tree, though when pushed for food I found that the worms were not at all fastidious about devouring their brethren that were in the helpless chrysalis state. It was named *Pœciloptera compta* by the late Dr. Breckenridge Clemens, but as the genus *Pœciloptera* was pre-occupied in insects, Mr. A. Grote, of New York, proposed the generic term *Œta*, and we thus have a scientific name for our little moth—*Œta compta*—which the most prejudiced against the so-called "Crack-jaw-Latin" can hardly find objection to.

The easiest way of getting rid of the worms is to cut off the branch containing the nest and burn it.

ŒTA COMPTA, Clemens.—*Larva.*—Average length when full grown 0.95. Slender, the diameter being 0.09. General color very dark olive-brown An extremely fine pearly-white dorsal and subdorsal line, and a somewhat more distinct stigmatal line of the same color; all three of them formed by minute white specks and lines. Dorsum, dull olive-green. A longitudinal line somewhat darker and in many cases quite black, below the subdorsal line. Between this last and stigmatal line is a stripe of the same color as dorsum, but speckled with white. Immediately below stigmatal line, it is rusty-yellow, especially on the middle segments. Venter sometimes olive-green, sometimes lead-color, finely speckled with white, and with a translucent line visible along the middle. This larva is mainly characterized, however, by a number of minute white piliferous spots, in strong contrast with the dark body, each giving forth a stiff white hair at right angles from said body. These spots are thus arranged on each side of every segment: 2 about the middle on subdorsal line; 1 under the anterior of these, just below the longitudinal dark line; 2 on the stigmatal line, with the stigmata which is of the same color between them; 1 in the orange part posteriorly; 2 small ones just below the orange part, and 2 in the middle of venter on the legless segments. Head of a beautiful brown, perpendicular, marked with black and speckled with white, two large spots being especially noticeable on the upper front. Cervical shield velvety-black, irregularly speckled with white. Thoracic legs black; abdominals extremely small and of the same color as venter; anals somewhat larger and brown.

Described from numerous specimens. The white spots are usually larger near the head while the hairs springing from them lean towards the head. The head itself is sometimes entirely black, while the white longitudinal lines are occasionally almost obsolete.

The young worm is pale and void of markings.

Chrysalis.—Average length 0.53. Not polished, but with the markings of the larva still apparent through the thin skin. General color dull smoky-brown, with a distinct broad dorsal band of a light rust-brown color along the abdomen, and a perfectly round spot of the same color on the top of the thorax, this spot generally giving forth a narrow orange line posteriorly.

Perfect Insect.—Average length 0.55; alar expanse 1.08. Fore wings bright lustrous golden-orange, crossed transversely with irregular bands of sulphur-yellow spots on a black ground as in the figure; fringes dense, narrow and brown. Hind wings smoky black, sub-hyaline except near apex and along margins; veins dusky, fringes also. Under surface of front wings dusky brown with the colors of the upper surface partly visible; under surface of lower wings concolorous. Head black with sulphur-yellow tufts; eyes black; palpi alternately black and sulphur-yellow; antennæ filiform, slightly serrate, black with a white shade along the upper terminal third. Thorax black with a wavy sulphur-yellow collar, golden-orange shoulder-covers with a spot of the same color between them, and two sulphur-yellow spots below this last. Abdomen steel-blue above, with a large brimstone-yellow patch on each segment below. Under surface of thorax black with brimstone-yellow patches; legs black, the front pair with yellow *coxæ* and orange thighs, the other four with more or less yellow, especially on the thighs.

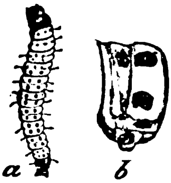
Described from numerous specimens. No particular sexual difference, except in the form of the body.

THE WALNUT TORTRIX, *Tortrix Rileyana*, Grote—Pl. 2, Figs. 3 and 4.

(Lepidoptera, Tortricidæ.)

During the month of May large bunches of the leaves of the Black Walnut and of the Hickory may be found drawn together by a silky web, and living within these bunches, a nest of caterpillars of a yellow color and marked as at Figure 85, *a; b* showing a side view of one of the segments. During the latter part of the month they change to little honey-yellow chrysalids, within the nest, and by the middle of June these last work their way through the leaves to the outside, by means of rows of minute teeth which they have on the back. Here they hang in great numbers by the tips of their abdomens, and in a short time the moths escape.

[Fig. 85.]



This moth is represented at Plate 2, Figure 3, with the wings expanded, and at Figure 4 with wings closed. It is prettily marked, the fore wings being of an ochreous color with a golden tint, and darker spots, and the hind wings of a deep golden color. It was first described by Mr. Grote, of New York, in the Transactions of the American Entomological Society, Vol. II, p. 121. It was quite common in 1868 along the Iron Mountain road, and seems to be peculiar to Missouri. It also seems to prefer the young Hickories and Walnuts to the older or larger trees, as I found few nests that were out of reach.

On the Snowberry * (*Symphoricarpus vulgaris*), similar nests may be found at the same time of year, containing caterpillars agreeing in description with those feeding on the Walnut and Hickory, except in being smaller. They go through their transformations in the same manner and produce moths similarly marked but uniformly paler in color, of smaller size and with less contrast between the upper and lower wings. We have here an excellent illustration of what Mr. Walsh has called Phytophagic variation,† for the Snowberry and Hickory feeding worms were evidently of but one species, and the difference in the moths was caused in my estimation by the difference in food. Mr. Grote, it is true, describes the small form as the male and the large form as the female, but the difference is not sexual, as the two sexes occur alike in both forms.

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* They also occur on the Ironweed (*Vernonia fasciculata*), though I have not bred the mo from worms feeding on this plant.

TORTRIX RILEYANA, Grote—*Larva*—Length, Hickory feeding, 0.60-0.80; Snowberry feeding, 0.40-0.50. Largest on segment 2, tapering thence gradually to anus. Ground color dull yellow. Covered with large, distinct, black, sealing-wax-like, slightly elevated spots, each giving rise to several fine bristles. These spots are thus arranged on each segment: 2 each side of dorsum the posterior ones widest apart; 1 at sides in the middle of the segment, containing the stigmata in its lower hind margin; 1 smaller and narrower just below this, on a somewhat elevated longitudinal ridge, and 1 round one below this ridge on the posterior part of the segment. Segments 2 and 3 have but one spot each side of dorsum. Two distinct wrinkles on all the segments, more on 2 and 3. Head, cervical shield and caudal plate black. Venter dirty yellow with black marks; legs ditto.

Chrysalis—Honey-yellow, robust in the middle, and with two transverse rows of minute teeth across the back of each segment.

Perfect Insect—From Hickory—Average expanse 1 inch, length of body, 0.35. Deep ochreous. Fore wings evenly washed with purplish, leaving the fringes and costal edge dark ochreous. The markings take the shape of dark velvety brown rounded maculations, generally of small size and faintly shaded with ochreous on the edges. Three of these subterminally at the base of the wing, subequal, situated interspaceally between the nervures. At a little within the middle of the costa are two fused maculations, the most prominent. Before and beyond these, some faint costal marks. At the extremity of the discal cell, above median nervure, is the first of a series of maculations, normally four in number but not constant, usually uneven in size. A subterminal series of spots is inaugurated on costa by a large, compound shaded maculation. Below this, over the median nervules, sweeps an outwardly rounded series of small approximate dots. Two dots on costa, within and at the apex, and a faint terminal series of minute streaks is shortly discontinued. Hind wings of a lustrous bright deep ochreous; pale along the costal margin and darker shaded along internal margin. Beneath, as are the hind wings above; both wings immaculate, fore wings the darker. Body and appendages concolorous, bright deep ochreous. Antennæ simple. Numerous bred specimens.

From Snowberry—var. symphoricarpi—Much paler, the fore wings not being as dark as the hind wings of the above. The upper surface of fore wings not washed with purplish but merely of a darker ochreous than the hind wing. The maculations entirely similar but ferruginous, paler and the slighter costal marks obsolete. Legs at base and under thoracic surface almost whitish Average expanse, 0.62; length of body, 0.30. Described from numerous specimens. Under surfaces exactly alike in both varieties.

THE SEED-CORN MAGGOT, *Anthomyia zeas*—N. Sp.—Pl. 2, Fig. 24.

(Diptera Muscidæ.)

DESTROYING THE SEED AFTER IT IS PLANTED.

About the 20th of last June I received the following letter from A. S. Fuller, of Ridgewood, New Jersey:

"DEAR SIR: I send you, by mail, a small box containing kernels of sprouted corn, upon which you will find small white worms. Some of the corn fields in this vicinity are being ruined by this pest. These worms attack the corn before it comes up. What are they?"

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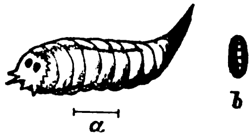
† See his paper in Proc. Phil. Ent. Soc., Vol. V, p. 194-216.

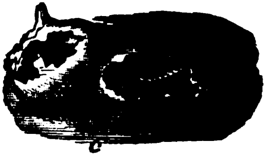
Subsequently I was informed that the seed-corn in other fields in Bergen county, New Jersey, was being destroyed in the same manner. The cause of this destruction is a footless maggot, measuring 0.25 to 0.30 of an inch in length, of a yellowish-white color, blunt at the posterior and tapering at the anterior end. It is a new foe to corn, and it is to be hoped that it is confined to the localities above mentioned. In order that it may at once be recognized, I give the following brief account of it:

[Fig. 86.]



This maggot is shown, enlarged, at Figure 86 *a*, the hair line underneath giving the natural size. It greatly resembles the Onion maggots, which are known to attack the onion in this country, and its work on corn is similar to that of this last named maggot on the onion; for it excoriates and gnaws into the seed-corn, as shown at Figure 87, and finally causes such seed to rot.

[Fig. 87.]



After having become full fed, these maggots usually leave the kernels for the surrounding earth, where they contract into smooth, hard, light-brown pupæ, of the size and form of Figure 86 *b*, and in about a week afterwards the perfect fly pushes open a little cap at the anterior end, and issues forth to the light of day. In this state it is a two-winged fly belonging to the order Diptera, and quite inconspicuous in its markings and appearance. Though I bred but two females, and this sex fails to exhibit some of the most important generic characters, yet there is nothing in the females of this species to distinguish it from the genus *Anthomyia* proper, of Meigen, as restricted by Macquart, and this Corn maggot, therefore, belongs to the same genus as the imported Onion fly (*Anthomyia ceparum*, Meigen). Upon submitting a specimen, for inspection, to Dr. Wm. Le Baron, of Geneva, Illinois, who has paid especial attention to our two-winged flies, he informed me that it is distinct from any hitherto described North American species, and I have, therefore, called it the Corn Anthomyia (*Anthomyia zeas*).

ANTHOMYIA ZEAS ♀, N. SP. (Pl. 2, Fig. 24). Length 0.20; alar expanse 0.38. Antennæ black; style mircoscopically pubescent; front, fulvous, with a distinct, rather narrow, brownish, cinereous margin; face and orbits brownish-white; palpi and proboscis black; ocellar area somewhat heart-shaped; thorax and abdomen pale yellow-brownish cinerous, with minute black points at the insertion of the bristles; thorax with an indistinct middle stripe of brown; legs black, tinted with cinereous; poisers pale orchre-yellow; scales small, the upper valve larger than the lower.

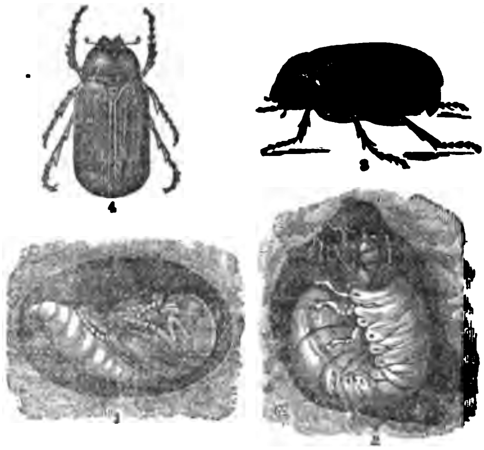
It is difficult to suggest a remedy for this pest, as its presence is not observed till the mischief is done. Hot water has been found effectual in killing the Onion maggot, without injuring the onions, and would doubtless prove as effectual for this Corn maggot, where a few hills of some choice variety are attacked, which it is very desirable to save. But its application in a large field, even if one knew where to apply it, would be impracticable, and I can only suggest soaking the seed, before planting, in gas-tar or copperas, and hope that the experiment will be tried next spring by those of our Eastern friends who have suffered from this maggot.

The larvæ of the genus *Anthomyia* live, for the most part, on vegetable matter, and seem to prefer it in a state of decay. Some, however, breed in excrement. Besides this corn species and the onion maggot already spoken of, there is one in this country that attacks radishes, and another that attacks the stem of cabbages. Specimens of this last species have been sent to me by Professor A. N. Prentiss, of Michigan Agricultural College, with the statement that they were proving very injurious to this esculent, around Lansing, in that State, and the flies produced from them seem to be identical with the species that attacks the cabbage in Europe (*Anthomyia brassicæ*, Bouché).

THE WHITE GRUB.

Larva of the May-beetle, *Lachnosterna quercina*, Knoch.

(Coleoptera, Melolonthidæ.)



[Fig. 88.]

The "White Grub is one of the very worst and insidious of the farmer's foes. To give its metamorphoses at a glance, and to obviate the necessity of verbal descriptions of so common an insect, I have prepared the annexed figure (88) which illustrates the full grown larva (2), the pupa (1), and side and back views of the beetle (3 & 4). The following letter from Mr. Jno. P. McCartney, of Cameron, is a sample of numerous accounts of its depredations which I have received during the year.

"Cameron, Missouri, Sept. 21, 1868.

"Mr. C. V. Riley, *Dear Sir:* The White grub worms have done us in this part of the State a great deal of damage. Will you please give us a history of the insect's habits. The grubs are now full grown, fine fat fellows. Two years since (1866), during the last of May, the beetles were very plenty. After sundown they came in great numbers and swarmed around the tops of the trees on the lawn, making a noise like the coming up of a storm of wind and rain. Last year (1867), the grubs did but little damage. What we want to know is, when will they leave the ground again as beetles? If they spend another summer in the ground it will be of but little use to try and raise a crop on the land that is now full of them. They have ruined all the meadow in this vicinity."

It is characteristic of the beetle to appear in vast swarms during the month of May—earlier or later, according to season or latitude. The beetle is quite voracious, and often greatly injures both fruit and ornamental trees. I have known the Lombardy poplar to die, in consequence of the utter denudation they caused; while last June certain groves of both Pin and Post oaks on the farm of Mr. Flagg, of Alton, Illinois, were so thoroughly and suddenly denuded by them, that Mr. Flagg could not at first divine the cause. Their existence in the beetle state is however short, and as they are confined to the foliage, their injuries are exceedingly small compared with those which their larvæ inflict upon us. Our meadows, strawberry beds, corn, vegetables, and even young nursery stock, are all subject to the attacks of these White grubs, and often ruined by them. Soon after pairing, the female beetle creeps into the earth, especially wherever the soil is loose and rough, and after depositing her eggs, to the number of forty or fifty—dies. These hatch in the course of a month, and, the grubs growing slowly, do not attain full size till the early spring of the third year, when they construct an ovoid chamber, lined with a gelatinous fluid; change into pupæ, and soon afterwards into beetles. These last are at first white, and all the parts soft as in the pupa, and they frequently remain in the earth for weeks at a time till thoroughly hardened, and then, on some favorable night in May, they rise in swarms and fill the air.

This, is their history, though it is very probable, as with the European Cock-chafer (a closely allied species), that, under favorable conditions, some of the grubs become pupæ, and even beetles, the fall subsequent to their second spring; but growing torpid on approach of winter, remain in this state in the earth, and do not quit it any sooner than those transformed in the spring. On this hypothesis, their being occasionly turned up in the fresh beetle state at fall plowing, becomes intelligible.

Remedies.—As natural checks and destroyers of this grub, may be mentioned the badger, weasel, skunk, marten, the crow, and the different hawks, but especially the Ground beetles among insects, some of which have been figured on page 115. Hogs are fond of them, and a gang may be turned into an infested meadow, which is to be cultivated the next year, with good advantage. The grub sometimes so thoroughly destroys the roots of meadow grass that the sward is entirely severed; in such cases a heavy rolling would doubtless kill great numbers of them. Applications of ashes and salt have been recommended, but I think they are of doubtful utility, unless sufficiently applied to saturate the ground to the depth of more than a foot. A field or meadow is badly injured during a certain year by the full grown grubs. The following spring the owner, ignorant of the insect's history, applies some substance to the land as a remedy, and finding no grubs during the summer following, will naturally conclude his application was effectual, when in reality the insects left of their own accord in the beetle state.

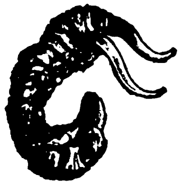
During their periodical visits as beetles, they should be shaken from the trees, gathered up, scalded and fed to hogs. As an illustration of what may be done in the way of hand-picking, I will state that under the efforts of M. Jules Reiset, the incredible amount of 160,000 kilogrammes, or about eighty millions of similar White grubs were collected and destroyed in a portion of the Seine-Inferieure of France, during the autumn of 1866.

The beetles make their appearance in different localities with great regularity every three years, and in a case like that communicated by Mr. McCartney, I should advise him to plant freely next spring without fear of their ravages; for he may rest confident that they will issue as beetles next spring and not be very troublesome again, as grubs, till the summer of 1871. At Unionville, according to Mr. A. L. Winchell, the beetles appeared "in millions" last spring, and I hope soon to be able to give the years in which they will appear in the different localities throughout the State. The White Grub is subject to the attack of a curious fungus, which the following item from the Sedalia, Pettis county, *Press* very well describes:

"W. B. Porter, of this county, has left at our office a specimen of the White Grub, so formidable as a corn, potato, and grass destroyer. There are two sprouts of green, vegetable growth, growing out of the head of the *grub*, one on either side, of nearly half an inch in length, resembling a hog's *tusk* in shape. Mr. Porter informs us that the one presented is by no means an isolated example, but that myriads of them can be found which present the same anomalous combination of animal and vegetable life. Who will explain this aberration from the well settled laws of organic life?"

In the second volume of the late *Practical Entomologist*, page 16, an account was given of the same fungus, great numbers of the grubs on Mr. Paulding's place at Tipton, Iowa, being affected with it. Dr. Kirtland, of Ohio, also evidently refers to the same fungus as being well known to science in the *Prairie Farmer* for 1865, Vol. XVI, p. 71. At Figure 89, I represent one of the grubs as it appears when attacked by this fungus, drawn from specimens received from Mr. Porter. The sprouts are almost invariably two in number and proceed from the corners of the mouth, but in one specimen which I have, there is but one near the mouth, the other protruding from the middle of the back.

[Fig. 89.]



In Virginia the grub seems to be attacked by another fungus, as the following letter of Mr. Sam. H. Y. Early, which was communicated to Mr. Walsh by the well known Entomologist, Wm. H. Edwards, abundantly shows:

"There is a white mushroom known in the region in which I was raised, as poisonous and fatal to the hogs that feed on it. I believe it is common in all localities in which I have been. In the spring of 1842 I observed in what is called a 'new ground' in Virginia a great quantity of these mushroom, and in reply to some remark I made about them, some of my father's negroes. who were then making hills with hoes for planting tobacco, inquired of me if I knew what produced these mushrooms. On my replying in the negative, I was informed that they grew from the White grub worm. I think there were some twelve or fifteen negroes present, all of whom curcurred in the statement, and said it was no new thing to them. They had no difficulty in establishing the truth of what they stated, because they dug them up in all their stages of germination and growth before my own eyes. In a very short time they had furnished me with a large number of the worms in their original shape, features and size, and as distiuct to the eye as if they had been alive, but having the consistency, color and smell of a mushroom; and I actually broke them up, just as a mushroom breaks in one's hands, snapping them crosswise and sqarely off. Many others I found to be enlarged before germinating, and many just germinating, but with the shape of the worm preserved. And in some I noticed that the features of the worm were preserved in the root, even after the mushroom had grown up through the earth and attained some size. I gathered a good many specimens in their various stages into my handkerchief, and carried them to my father's house, where they lay on the mantel for some time. They seemed, however, to be no novelty to many to whom I exhibited them. In fact they were familiar to almost all who had opportunities of investigation, and to whom I mentioned them at the time."

Whether there is any relation between these two fungoid growths further investigation will alone tell; but when we shall have become better acquainted with them we may possibly be able, by sowing the spores of either kind to effectually kill the White Grubs in our fields.

THE AMERICAN MEROMYZA—*Meromyza Americana*, Fitch.—Pl. 2, Fig. 28.

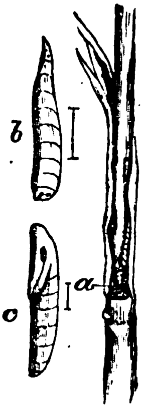
(Diptera Muscidæ.)

ATTACKING WHEAT.

About the middle of the month of June last, in all the wheat fields which I examined between Bluffton on the Missouri river and St. Louis, I noticed that a great many of the ears had prematurely ripened, had turned yellow and were stunted and shorter than the rest, and upon examination the kernels proved to be withered and shrunken.

In most fields about one per cent of the ears were thus affected, but in two fields near Hermann, from three to four per cent were injured in this manner. This appearance was variously attributed to Hessian fly, Midge, etc., etc., no one seeming to know the true cause. Upon examination I found that the last or ear-bearing joint could invariably be pulled out of its sheath with but a slight effort, and that it was perfectly yellow and dry, while the lower end bore an irregular and gnawed appearance. Upon splitting open the first joint of the stalk, a space of about a quarter of an inch was found to be completely corroded, so to speak, and filled with excrementitious matter, as shown at Figure 90. *a*. In this space would generally be found a pale watery-green maggot of the form of Figure 90, *b*, attenuated at one end and blunt at the other. I took a number ef infested stalks home, and many of the maggots changed to green pupæ of the form and appearance of Figure 90, *c*. Before changing to pupa the maggot would sometimes crawl away from the joint and get nearer the head, between the stalk and the sheath. The pupa state lasted from 12 to 14 days, and the first flies emerged during the first week in July.

[Fig. 90.]



This fly is represented, magnified, at Plate 2, Figure 28, and belongs to the genus *Meromyza* in the family MUSCIDÆ of the order DIPTERA. It appears to be the very same species which Dr. Fitch found flying about wheat fields in New York State, and which he described and named as the American Meromyza (*Meromyza Americana*), on page 299 of his 1st and 2d Reports.* He did not ascertain the habits of the larva, however, and they have ever since remained unknown. The fly measures, on an average, 0.17 to the tip of the abdomen, and expands about 0.20. It is of a pale yellowish-green, the head being more inclined to straw color. The eyes are black and there is a round black spot between them on the top of the head. There are three broad black stripes, with a bluish-gray cast, on the thorax, the middle one straight and extending anteriorly to the pedicel of the neck, the outer ones slightly rounded outwardly, not extending so far anteriorly, but extending around the scutel and joining the middle one posteriorly. The abdomen also has, above, three broad blackish stripes, which are confluent posteriorly and interrupted at each of the sutures. Wings prismatic, hyaline and greenish anteriorly, their veins and the tips of the feet being dusky.

In Europe the larvæ of the closely allied genera *Chlorops* and *Oscinis* have long been known to attack some part or other of the stalks of wheat, rye, barley and other small grains. Several species are figured and described by the English Entomologist Curtis in his

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* My specimens are all somewhat smaller than Dr. Fitch's according to his description, and have black eyes instead of "bright green;" but upon submitting specimens to Baron R. Osten Sacken who makes a specialty of *Diptera* he referred it to the same species.

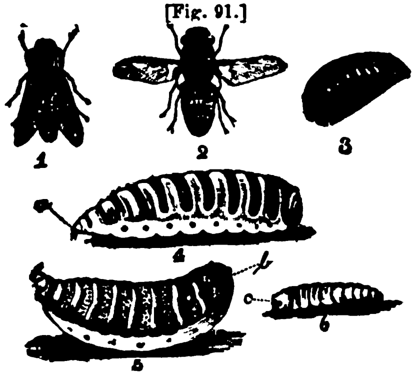
"Farm Insects," and one of them—the *Oscinis vastator*—though a very different fly, seems to have almost precisely the same habit as our insect. It is quite probable, also, that in this country as in Europe, there are two broods during the year, the second brood of larvæ attacking grain sown in the fall, but further investigation alone will decide these points.

Remedies.—Much can be done in an artificial way by cutting off and destroying all the infested stalks, which may readily be recognized by the signs already described; but even if this plan should faithfully be carried out, it is doubtful whether it would pay in a country where labor is so scarce and demands such high wages as in ours. We therefore have to fall back on the only practical means within our reach, viz: that of varying the culture by alternate courses, and this style of cultivation will have to be more generally adopted, should this pigmy foe sufficiently increase as to greatly diminish the yield of the "staff of life." There is every reason to believe, however, that Nature has her own means of keeping these flies within due bounds, for they are known to be preyed upon by parasitic Ichneumon flies in Europe, and I noticed many flies of this last description, of polished hues and active movements, deftly darting through, and resting upon the wheat plants of the fields infested with the *Meromyza.*

THE SHEEP BOT-FLY OR HEAD MAGGOT—*Œstrus ovis*, Linn.

(Diptera, Œstridæ.)

[Fig. 91.]



For the benefit of sheep raisers I give the following brief account of the insect which causes "Grub in the head." The annexed illustration (Fig. 91) represents it in all its stages. 1 shows the Gadfly, life size, with wings closed; 2 the same with wings expanded; 3, the pupa from which the fly has escaped; 4 the full grown larva, dorsal view; 5 the same, ventral view; 6 the same when younger.

This insect is the dread of sheep in the Old as well as the New World, and was made mention of by the Greek physician, Alexander Trallien, as far back as the year 560.

The flies make their appearance in June and July, and deposit living maggots in the nostrils of the sheep. As soon as they are deposited they ascend the nostrils, causing great irritation on their way, until they reach the frontal sinuses; there they attach themselves by the little hooks or tentacula placed each side of the head, to the membranes which line the cavities, feeding on the mucus which is always to be found in them. Until they attain their growth they are of a creamy white color, with two brown spots placed side by side on the posterior segment. These spots, (6, *c*) are spiracles or stigmata, through which the worm breathes. The segment with these two spiracles, is retractile, and can be drawn in and hidden at the worms pleasure. When full grown, the grub becomes darker, particularly towards the tail, the white of the first two or three segments becoming dirty white on the 4th or 5th, and growing darker on each successive segment until the last, which is of a very deep brown. It has two small parallel hooks or tentacula at the head (*a*), and above these, two very small tubercles, not very easily shown in the engraving. It also has a small brown elevated round spot on each segment along the sides, which might at first be taken for spiracles but which are not, and also two small corneous appendages (5, *b*) on each side of the anus. The ventral region has a band of small elevated dots running the breadth of each segment in their middle, which, under the magnifier appear to be minute brown spines, all pointing posteriorly. (See Fig. 91, 5). These aid the worm in its movements.

When ready to contract into a pupa, it descends down the nostrils of the sheep and falls to the ground, where it quickly buries itself and in about 48 hours, contracts to half its former size, and becomes smooth and hard and of a black color, tapering as in the larva towards the head. It remains in this state from 40 to 50 days, or more, according to the weather, when the fly pushes open a little round cap-piece at the head and thus arrives at maturity.

In this stage it looks something like an overgrown house-fly. The ground color of the upper part of the head and thorax is dull-yellow, but they are so covered with little round elevated black spots and atoms (scarcely distinguishable without the aid of a magnifier) that they have a brown appearance. The abdomen consists of 5 rings, is velvety and variegated with dark brown and straw color. On the under side it is of the same color, but not variegated in the same way, there being a dark spot in the middle of each ring. The feet are brown. The under side of the head is puffed out, and white. The antenæ are extremely small and spring from two lobes which are sunk into a cavity at the anterior and under part of the head. The eyes are purplish brown, and three small eyelets are distinctly visible on the top of the head. It has no mouth and cannot therefore take any nourishment. The wings are transparent and extend beyond the body, and the winglets, which are quite large and white, cover entirely the poisers. Its only instinct seems to be the continuation of its kind. It is quite lazy, and except when attempting to deposit its young, its wings are seldom used.

It has lately become the fashion with many members of the Agricultural press, to ridicule the idea that sheep die at all from grub in the head, and many even deny that the grub is capable of any injury to the sheep whatever. From the fact that this grub may be found in the head of almost every sheep that dies, in the Western States at least, it is undoubtedly true that many other diseases are cloaked by the popular verdict of "grub in the head." It is none the less true, however, that those Agricultural editors, who pretend to instruct, simply show their lack of practical knowledge, in butting against that which must be the firm conviction of every flock master, viz: that sheep do die *of* grub in the head, Messrs. Youatt and Clark notwithstanding.

Mr. Youatt declares: "It is incompatible with that wisdom and goodness that are more and more evident in proportions as the phenomena of nature are closely examined, that the destined residence of the *Œstrus ovis* should be productive of continued inconvenience or disease." I agree most decidedly with Mr. Randall, that "this is as far fetched as a conclusion, as the reasoning on which it is founded."

If grub in the head is not productive of inconvenience or disease, as the disciples of Youatt have it, whence the suffering condition, the loss of appetite, the slow, weak gait, the frequent coughing, the slimy and purulent matter, sometimes so profusely secreted as at times to almost prevent the animal breathing? Whence the tossing and lowering of the head, and the fits of frenzy, to which so naturally quiet and gentle an animal as the sheep is subject? All these symptoms result from grub in the head, and the animal frequently gets too weak to rise, and finally dies. These effects of the grub were well recognized and understood by such old writers and close observers as Reaumur and Kollar; while Mr Dan'l Kelly, of Wheaton, Illinois; Towne Bros., of Geneva, Illinois; M. L. Cockrill, of Tennessee, and other well known flock-masters with whom I have either conversed or corresponded, are unanimous in ascribing these symptoms to the true cause; and the late S. P. Boardman, of Lincoln, Illinois, coincided with them in this respect. For my part, I would as soon believe that those parasites were beneficial, which are so injurious to man, either internally or externally, or those which prey upon our caterpillars and other insects, and invariably destroy them; for although, when there are but few grubs in the head, the injury they inflict is not perceptible, *they can never be beneficial*, and when numerous enough will undoubtedly cause death. They cannot live in the head of the sheep without causing great irritation by the spines with which the ventral region is covered and the hooks with which they cling to such a sensitive membrane as that which lines the sinuses. Moreover, when numerous enough to absorb more mucous than the sheep secretes, the grubs will feed on the membrane itself, and (according to the evidence of some practical sheep men) will even enter to the brain through the natural perforation of the ethmoid bone, through which pass the olfactory nerves; in either of which cases, they must cause the most excruciating pain. The natural fear also, which sheep have of the fly, and the pains they take to prevent its access to the nose, is of itself proof enough that it is obnoxious to them. The rabbit is subject to the attack of a very large gad-fly (the *Cuterebra caniculi* of Clark). I saw a half grown rabbit the past summer with an enormous swelling each side of its neck. On examination these swellings were found to be caused by the grubs of this fly, and the rabbit was so weakened and emaciated that it could scarcely move. No one could witness such a sight without being convinced that the parasite was injurious.

In the *Prairie Farmer* of October 14, 1865, the fact was published that the Sheep Bot-fly deposits *living* maggots in the nostrils of the sheep. It was published on the authority of Mr. Kelly, and both he and myself then believed it to be the first published account of the viviparous nature of this fly. But the following extract from a letter from the late lamented Samuel P. Boardman, of Lincoln, Illinois, shows that the same discovery has been made by three independent observers in this country. Mr. Boardman wrote as follows:

"All the authors, both European (at least all *English*) and American, from Youatt to Randall, will persist in saying that the fly deposits *an egg*, which hatches out, and crawls up the nostrils of the sheep, etc., etc. Now three independent and perfectly original discoverers have in our own country within twenty-five years past, disproved the book account of the grub's transformations.

"John Brown—'Old Ossawattomie John Brown,'—published an account in an Agricultural paper (I forget what one) about twenty years since, of his seeing, 'with his own eyes,' the fly drop the *perfectly formed and living grub* in the nostrils of sheep. Some seven years since, 'Old Dan Kelly,' of Du Page county, Illinois, made the same discovery and supposed that he was the only man who had ever done it. At the time he made known his discovery, at a meeting of the Illinois State W. G. Association held in Chicago, I thought also, that he was the first man to ever notice the like. Two or three years afterwards I saw the account of John Brown's discovery, in the *Ohio Farmer*, copied from an old paper dated about seventeen years previously. When Kelly and I were at the meeting of the National W. G. Association, I went with him to the *Ohio Farmer* office, and I found in the file, Old John Brown's account. Mr. Kelly took a copy of the *Farmer* containing it, home with him. That makes *two* perfectly original and independent discoveries of the fact alleged. Now then, within a year past (I think) I have seen a letter from Mark Cockrill, of Tennessee, (who, before the war, was one of the oldest, largest and richest wool growers in the South, as well as one of the richest men in the South), in which he speaks of having made the same discovery years ago, and in which he speaks of it as if he thought he was the only, and original discoverer. Here are three men widely separated, who, we must acknowledge, are all capable and honest observers, and yet, Randall, (or at least his publisher) continues to put forth in every new edition of the '*Practical Shepherd*,' the same old exploded (or should be) notion of the fly depositing *an egg*. I presume it is altogether likely that all modern English writers on sheep keep up the same thing—by copying from Youatt."

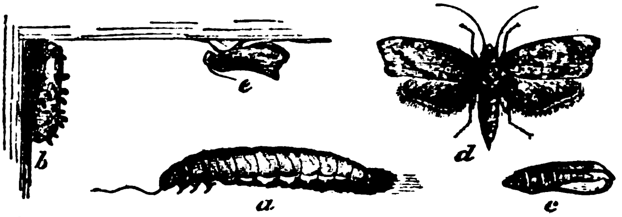
On one occasion in 1866, I myself obtained living maggots from one fly and Mr. Cockrill has since obtained over 300 living, moving worms from one that was caught while she was after the sheep. Many flesh flies, if they cannot find suitable meat or carrion on which to lay their eggs, retain these egg so long in their bodies that they hatch there, into living larvæ; and it is not impossible that the above observations were made with flies that had been so circumstanced, but I think it highly improbable, and strongly incline to believe that it is the normal nature of this fly to produce living larvæ. I incline to this belief the more strongly, from the fact that it would be difficult to attach an egg to the slimy nostrils of a sheep.

To prevent it from depositing its young, different means are resorted to. Mr. Randall says that "some farmers turn up the soil in portions of their pastures, so that the sheep may thrust their noses into the soft ground, on approach of the fly, while others smear their noses with tar, or cause them to do so themselves." But as the fly is very persevering, and generally attains her object, the means to be depended on the most, is the dislodging of the larva, or "grub," and so far, lime has been thought to be the most effectual, and should be given them, that they may by sniffing it, cause sneezing, and in many cases dislodge the grub. Some sheep keepers even shut their sheep up for several nights, in a tight barn, when first taken up in the fall, believing that the close and heated atmosphere induces the grub to descend, and is therefore more readily dislodged, and that the injury accruing from such foul air, is trifling, compared with the benefit received by dislodging the grubs. Other sheep breeders are in the habit of fixing salt logs in their pastures, of sufficient length to enable all the sheep to get at them. Into these logs, at distances of five or six inches, holes are bored with a two-inch auger, and during fly season a little salt is kept in these holes, while every two or three days tar is smeared around them with a brush. The sheep in obtaining the salt, tar their noses, and the odor of the tar keeps the fly away. In severe cases where the grubs are already in the head, they may be dislodged in a measure, by a feather dipped in turpentine, which should be run up the nose and gently turned.

INSECT ENEMIES OF THE HONEY-BEE.

THE BEE-MOTH OR WAX-WORM,—*Gallerea cereana*, Fabr.

[Fig. 92.]



Large hawk-moths sometimes enter a beehive for what honey they can get, and even mice have been known to enter a hive; while several parasites live upon the bees themselves. In our own State as I shall presently show there is a large two-winged fly which seizes the bee while on the wing and kills it. But by far the worst enemy the bee-keeper has to contend with, is the Bee-moth (*Galleria cereana*, Fabr). This insect is so well known to bee men generally, that it scarcely needs a description. It is well illustrated above (Fig. 92) in all its stages, *a* showing the full grown worm, *b* the cocoon which it spins, *c* the chrysalis to which it changes, *d* the female with wings expanded, and *e* the male moth viewed from the side with the wings closed. It suffices to to say, that the color of the moth is dusky gray, the fore wings which are scalloped at the end, being more or less sprinkled and dotted with purple-brown. The female is generally a good deal larger than the male, though there is not so much difference between the sexes as some writers have supposed. The worms which produce these moths are of an ash-gray color above, and yellowish-white beneath.

The Rev. L. L. Longstroth, in his excellent work on the Honey-bee, which every bee-keeper should possess, has given such a complete account of the Bee-moth, that it is only necessary for me to mention a few of the most important facts with regard to it, my object being principally to show that there can be no such thing as a *moth-proof hive*; that wire-gauze contrivances are of no avail, and that the man who pretends to sell a moth-proof *hive*, may usually be set down as a know nothing or as a swindler.

The Bee-moth was first introduced into this county from Europe, about the commencement of the present century, and it was in all probability imported with the common bee-hive. There are two broods of the moth each year, the first brood appearing in May and June, and the second, which is the most numerous, in August. During the day time, these moths remain quietly ensconced in some angle of the hive, but as night approaches, they become active, and the female uses her best endeavors to get into the hive, her object being to deposit her eggs in as favorable a place as possible. Wire-gauze contrivances are of no avail to keep her out, as she frequently commences flying before all the bees have ceased their work. But even if she were entirely prevented from entering the hive, she could yet deposit her eggs on the outside, or by means of her extensile ovipositor, thrust them in between the slightest joint or crack, and the young worms hatching from them, would readily make their way into the hive. The moment the worm is hatched, it commences spinning a silken tube for its protection, and this tube is enlarged as it increases in size. This worm cuts its channels right through the comb, feeding on the wax, and destroying the young bees on its way. When full-grown, it creeps into a corner of the hive or under some ledge at the bottom, and forms a tough white cocoon, of silk intermingled with its own black excrement as in figure 92, *b*. In due time the moth emerges from this cocoon.

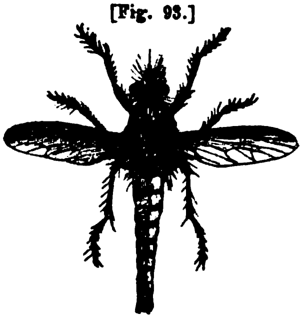
A worm-infested hive may generally be known by the discouraged aspect which the bees present, and by the bottom-board being covered with pieces of bee-bread mixed with the black gunpowder-like excrement of the worm. It must not be forgotten, however, that in the spring of the year, pieces of bee-bread at the bottom of a hive *when not mixed with the black excrement*, is not necessarily a sign of the presence of the worm, but, on the contrary, may indicate industry and thrift. If a hive is very badly infested with the worm, it is better to drive out the bees and secure what honey and wax there may be left, than to preserve it as a moth breeder to infest the apiary. If put into a new hive, the bees may do something, and if they do not, there is no loss, as they would have perished, finally, from the ravages of the worm.

It should invariably be borne in mind that a strong stock of bees is ever capable of resisting, to a great extent, the attacks of the worm; while a starved or queenless swarm is quite indifferent to its attacks. In a common box hive, a good way to entrap the worms after they are once in a hive, is to raise the front upon two small wooden blocks, and to put a piece of woolen rag between the bottom-board and the back of the hive. The worms find a cozy place under the rag, in which they form their cocoons, and may there be found and killed, from time to time. Much can be done in the way of prevention, by killing every morning, the moths which may be found on the outside of the hives. At this time of the day, they allow themselves to be crushed, with very good grace; and if two or three be killed each morning, they would form an important item at the end of the year, especially when we recollect that each female is capable of furnishing a hive with at least 300 eggs. In conclusion, I give it as my conviction that immunity from the ravages of this Bee-worm can only be guaranteed where a thorough control is had of both hive and bees; hence the great importance of the movable frame hive.

THE BEE KILLER—*Trupanea apivora*, Fitch.

(Diptera, Asilidæ.)

[Fig. 93.]



In the last chapter of his 9th Report, Dr. Fitch describes a fly by the name of the "Nebraska Bee-killer," which he received from Mr. R. O. Thompson, of Nursery Hill, Otoe county Nebraska, and which the latter named gentleman had found preying upon the bee in North Nebraska in the summer of 1864. Mr. Thompson has since removed from Nebraska to North Missouri, and in conversation with him last summer he informed me that he had met with this Bee-killer each year since 1864, and that it seemed to be increasing. At a later day, in a communication to the *Rural World* of September 12, 1868, he states that it made its appearance in such numbers in North Missouri last summer, that it to a great extent prevented the bees from swarming. I present above at Figure 93 a life-size portrait of this voracious insect, its general color being yellowish-brown or yellowish-gray. This figure will enable its ready recognition, and those who wish a very full and detailed description of it will find it in the Report of Dr. Fitch above referred to. It belongs to the *Asilus* family of two-winged flies which have been very aptly termed the hawks of the insect world. Last July I found thse flies quite common in Mr. Shaw's beautiful gardens in St. Louis, and I watched them by the hour and found to my amazement that though other insects were flying all around, as well as other species of bees, yet they never seized any other species but the common Honey-bee. They capture the bee on the wing, pouncing upon it with lightning-like rapidity; then grasping it securely with their fore legs, they alight upon some plant or even upon the ground, and rapidly suck out the inside of the bee, with the stout and powerful proboscis which is shown in the figure, leaving the empty shell when they get through. Mr. Thompson says that beneath some favorable perch that is near the apiary, hundreds of these bee-shells may be found accumulated in a single day; while he has watched and found that a single fly on one of these perches destroyed no less than 141 bees in that period of time.

The habits of these flies are little known, and until they are better understood no feasible way of protecting the bees from their attacks can be given. Those which are known to haunt the apiary should be captured, and this can best be done by means of a net. It is almost impossible to catch them while on the wing, though as soon as they have settled with their prey they are caught with comparative ease. It will pay to thus catch them for they are doubtless the cause of much of the non-swarming which we hear of.

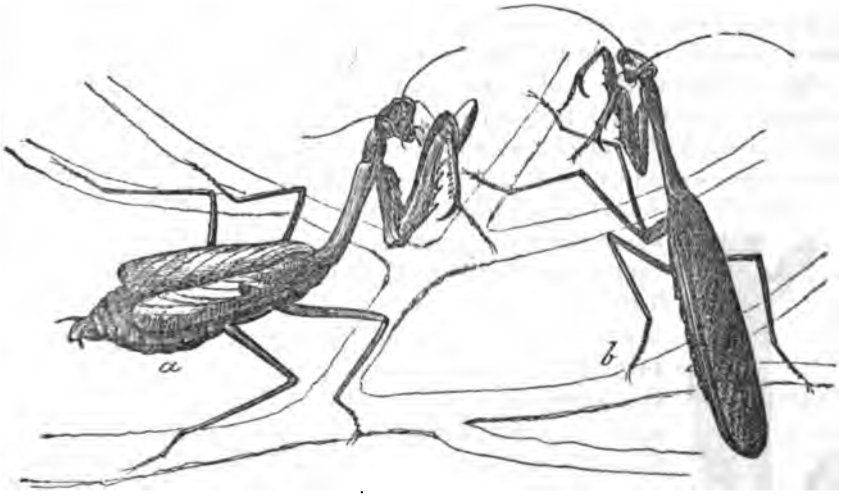
BENEFICIAL INSECTS.

I have already treated of a number of beneficial insects in connection with the insects on which they prey, and under this head I shall, for the present, only say a few words about

THE REAR-HORSE, *alias* CAMEL-CRICKET, *alias* DEVIL'S RIDING HORSE—*Mantis Carolina*, Linn,

(Orthoptera Mantidæ.)

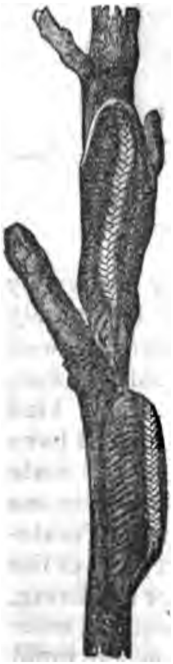
[Fig. 94.]



This peculiar and predatory insect which is variously known by either of the above names in different localities, is very fortunately quite common in the central and southern parts of Missouri, as well as in most of the Southern States. Its food consists mainly of flies, though it is a most voracious cannibal and will devour its own kind as well as any other living insect that comes within its grasp. I have known it to attack various kinds of butterflies, including the male Bag-worm, grasshoppers, and caterpillars of various kinds, and in one instance a single female devoured eleven living Colorado Potato-beetles during one night, leaving only the wing-cases and parts of the legs. It disdains all dead food, and never makes chase for the living, but warily, patiently and motionless, it watches till its victim is within reach of its fore-arms, and then clutches it with a sudden and rapid motion. Its appearance is really formidable, and its attitude while watching for its prey quite menacing, and on this account it is held in very general and superstitious dread. It is, however, utterly incapable of harming any one; and, as one of our best friends should be cherished and protected.

At Figure 94, above, this insect is represented in the full grown state, *a* showing the female and *b* the male. It will be seen that they differ materially from each other, the male having a long slender body with long wings, while the female has a broad flat body with short wings. Hence, while the male can fly through the air with greater facility than do our grasshoppers, the female is utterly incapable of performing the same feat, and only uses her wings when in battle with one of her own kind, or when pouncing upon her prey, at which time she hoists them very much as a swan hoists his wings when irritated. The difference in the sexes is not apparent till after the third moult, all the young Mantes being very much alike. The general color of the Mantis is grayish-brown though a pale green dimorphous form is quite common. The newly hatched larva is invariably, so far as my observations extend, light yellowish-brown, though I have seen green individuals after the first moult. The green form is almost entirely confined to the female sex, and seems to be the most common color of this sex when full grown; but it is found likewise, to some extent, among the males, as specimens with green legs and partly green bodies are to be met with, though I have never seen a male that was entirely green. About the beginning of August these Mantes acquire wings, and by the middle of September the female commences to deposit her eggs. These eggs are all glued tightly together in a peculiar mass, and are deposited in all sorts of situations, but principally on the twigs of trees. At Figure 95 two of these egg-masses are represented, natural size, the lower mass showing the most common form, the upper mass illustrating how it conforms to the object on which it is placed. These egg-masses are often found by persons in the winter, though very few are able to conjecture what they really are. On cutting them open the eggs are found to be very systematically arranged and to contain a mucilaginous substance of the color of thin glue.

[Fig. 95.]



The manner in which these eggs are deposited has never been described, and though I have never myself witnessed the operation, I have found the mass while it was yet quite soft and freshly laid, and have dissected the female just before she was about to deposit; and incline to believe that it is gradually protruded in a soft mucilaginous state, being covered at the time with a white, frothy, spittle-like substance which soon hardens and becomes brittle upon exposure to the air. Mr. Parker Earle informs me that he has witnessed the operation. and that he judges it to require about an hour, the eggs being "pumped out, and the entire mass elaborately shaped, with a fine instinct of construction as the process continues."

Between the 10th and 20th of June these eggs hatch into comical-looking little Mantes, in all respects resembling their parent, with the exception that they have no wings; for, with the grasshoppers, crickets, katydids, walking-sticks and roaches, etc., etc., which belong to the same order (*Orthoptera*), they do not undergo any sudden transitions from the masked *larva*, to the quiescent *pupa*, and thence to the winged *imago* state, as do most other insects.

When the young first issue from the egg-mass, they are yet, as with the young of most other *Orthopterous* insects, enveloped in a fine skin which confines their members and prevents free motion. In this condition they look not unlike some of our leaf-hoppers (*Tettigoniæ*,) but as soon as they extricate themselves they begin to show their unfeeling and voracious disposition by attacking and devouring each other. Indeed, those sentimentalists who believe that the worm crushed under foot suffers as much as the man who breaks an arm or a leg, would do well to study the habits of these Mantes. They are so void of all feeling that, the female being the strongest and most voracious, the male in making his advances, has to risk his life very many times, and at last only succeeds in grasping her by slyly and suddenly surprising her; and even then he frequently gets remorselessly devoured. I have seen a female, decapitated, and with her body partly eaten, slip away from another that was devouring her, and for over an hour afterwards fight as tenaciously and with as much *nonchalance* as though nothing had happened.

The eggs may be readily transported from one place to another, and the insect can thus be easily colonized. Mr. Jordon in this way has caused them to increase very much in his home nursery in St. Louis, though he finds some difficulty in protecting the eggs during the winter from the attacks of birds. He considers that as long as he can keep the Mantes sufficiently numerous he will never be troubled with noxious insects.

We know with what fear the hawk is regarded by the great majority of small birds, but that at the same time the common house martin defies and even tantalizes and drives it off. In like manner this Mantis which must be the dread of most flies, is yet defied by a certain class of them, belonging to the same (*Tachina*) family, as that described and figured on page 111, for I have found no less than nine maggots in the body of a living female Mantis, which must have hatched from eggs that had been deposited on her body by one of these flies.

INNOXIOUS INSECTS.

Under this head, I propose to devote a few pages each year to those insects which can neither be considered injurious or beneficial to man, either directly or indirectly. As State Entomologist I feel it my duty to devote my time primarily to the study of those insects that immediately concern the agriculturist, and by thus doing, to save to our great and growing State a portion of that immense sum which is annually lost by insect depredations. At the same time I feel that it will be expected of me to add to our present knowledge of the natural history of the State, by discoveries in my particular branch of zoology. The prosperity of a State does not depend solely on its material wealth, but to a great extent on its mental wealth. KNOWLEDGE—that great interpreter of oracles—moves the world! It enables us to see in the bowels of the unfathomable earth beneath, in the water, in the air, and in the skyey vast above, volumes written by the hand of Omnipotence!

> "To win the secret of a weed's plain heart,
> Reveals the clue to spiritual things,"

And there are few departments of science which offer such food for the mind as does the study of Natural History. It has been truly said that the naturalist has no time for selfish thoughts. Everywhere around him he sees significances, harmonies, chains of cause and effect endlessly interlinked, which draw him out of the narrow sphere of self-lauding into a pure and wholesome atmosphere of joy and felicity.

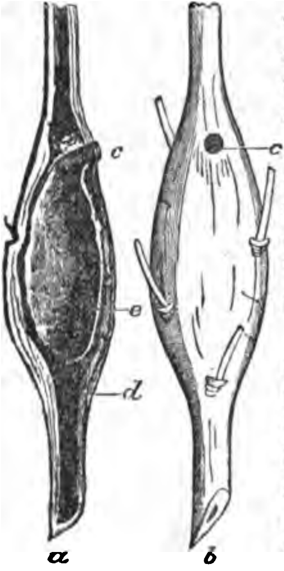
Day by day science is becoming more and more popularized, and before long the necessity of devoting more attention to natural history in our schools and colleges will become apparent. There are few things, for instance, so well calculated to train the minds of children, and at the same time entertain and instruct them as would be a chart illustrating the transformation of insects, and it is with the firm belief that this kind of information will soon be more generally sought for, that I introduce to my readers

THE SOLIDAGO GALL MOTH—*Gelechia gallæsolidaginis*, N. Sp. —Pl. 2, Figs. 1 and 2.

Every body must have noticed the large round galls about the size of a walnut which are found upon the straight smooth stem of the common Golden-rod (*Solidago nemoralis*). There are sometimes two on the same stalk and they are most conspicuous in winter time when the leaves are off the plant. Upon cutting open one of these galls it is found to consist of a pithy solid mass, in the centre of which is a plump white footless maggot. This maggot in due time develops into a two-winged fly, which was long since described by Dr. Fitch as *Trypeta* (*Acinia*) *solidaginis*.

The gall which I am now about to speak of, occurs on the same species of Solidago, and in almost equal abundance with the former, though its architect has never hitherto been described. This gall which is represented at Figure 96, *b*, is of a very different form from the preceding, being altogether more elongate and narrower, and upon cutting it open it is found to be hollow, and to contain, instead of a white footless maggot, a gray 16-footed caterpillar (*e*), which in time develops into the little moth which is represented with the wings expanded at Plate 2, Figure 1, and with the wings closed at Figure 2. The history of this insect may be thus briefly told:

[Fig. 96.]



The moths winter over and may be seen flying in the month of May, in which month I have myself captured a specimen. When the young plants of the Golden-rod are about six inches high the female moth deposits an egg either in the terminal bud, or at the side of the stalk just below it, and the worm hatching from the egg works into the stalk, and causes it to swell by gnawing and thus inducing the secretions towards it. By the beginning of June the gall has just begun to form and at this time upon cutting it open the worm is found to be about ⅛ grown, and its excrement is as yet all at the upper portion of the gall. As the plant grows, so the gall increases in size, remaining, however, at the same altitude from the ground. By the middle of July both the gall and its maker have attained their full size, and upon opening the former at this season of the year the excrement will be found packed closely at both its ends, and from the small quantity of such excrement (*d*) to be found, it would appear that all but the more solid parts had been absorbed by the plant, it probably acting as a manure to stimulate the growth of the gall. When full grown, the worm measures rather more than half an inch, and it now prepares for changing into the chrysalis state by eating a perfectly round passage-way entirely through the wall of the gall at its upper end. It then protects the orifice with a secretion of liquid silk which hardens and forms a perfect little plug (Fig. 96, *c*,) about 0.04 thick and 0.08 in diameter, and which is so constructed that it cannot be readily displaced from without, as it has a rim on its outer edge. The inner edge, however, is not so rimmed, and the plug can be pushed away from the inside with the slightest effort, for the little tenant when it shall have become fitted to leave its dark and secluded tenement and soar into the air, must needs make its exit through this orifice. Well may we wonder at Nature's handiwork, for what consummate skill, and wonderful instinct—I had almost said forethought—is here exhibited! Can this action be but a blind instinct, or has the larva a premonition of its future etherial imago state and its wants? Who can answer? Our little host, not satisfied with having thus protected the entrance to his home, now lines its passage way, and the walls, with a delicate silken tissue, after which he rests from his labors, and commences to undergo those mysterious transformations, so characteristic of his class. A gall cut in two at this stage of its growth presents the appearance of Figure 96, *b*. In two days' time the little worm has changed to a chrysalis, just ½ inch in length, rather slender and of a shiny mahogany-brown. At the end of about three weeks more the chrysalis grows very dark, and finally the inclosed moth bursts the skin and escapes from the gall.

The first moths usually appear about the middle of August, but as the time of egg-depositing covers a period of over a month, some of the moths have not left till the beginning of October. As winter approaches, the stem seems to grow weak above the gall, and usually bends and droops, while the gall itself shrinks and acquires a whitish weather-washed appearance. It is for these reasons, and from the gall being so near the ground that it does not attract the same attention as the large, round gall of the *Trypeta*.

I have been acquainted with this gall for six years, and have studied it closely during that time. It seems to occur quite generally over the country, and is especially abundant in the West. The first published account that I can find of it in this country is that given by Baron Osten Sacken, in the first volume of the Proceedings of the "Philadelphia Entomological Society," page 369, where he correctly describes it, as well as the puffed carcass of one of the caterpillars (Pl. 2, Fig. 5), caused by a parasitic *Chalcis* fly presently to be described; but he was not acquainted with the maker of the gall. The galls were received by him from Edward Norton, who resides at Farmington, Connecticut. They occur abundantly around Chicago, especially on the north side, in the old cemetery, which is now being converted into Lincoln Park. They are equally abundant around St. Louis, while I have found the same gall on the *Solidaga Missouriensis* growing beyond Fort Kearney, in Nebraska, and even there the worm was attacked by the same parasitic *Chalcis* fly mentioned above.

The gall-making insects belonging to the same order (Lepidoptera) as our little moth, are by no means common, and the only other gall of this character with which I am acquainted, at all resembling the one just described, occurs on the stems of *Artemisia compestris* in France, and is produced by the larva of a very different little moth with pale yellow wings shaded with orange, first described by Herrich-Schæffer by the name of *Cochylis hilarana*. This last gall is figured on Plate 1, of the "Annales de la Société Entomologique de France" for 1856, and its history is detailed by M. E Perris, at pages 33–38 of the same volume. The gall is similar in form, but narrower, with the walls thicker than that of my insect, while the larva is yellowish-white.

GELECHIA GALLÆSOLIDAGINIS, N. Sp.—*Larva.*—Length 0.60. Cylinderical. Color dark dull-brown, without shine. Largest on middle segments; tapering from 4th to head, and from 9th to extremity. Each segment impressed transversely in the middle, thus forming two folds, the thoracic segments having other such folds. Six small piliferous spots, two each side of dorsum and one above stigmata, which, together with the stigmata, are shiny and of a lighter brown than the body. Head and cervical shield light shiny-brown.

Chrysalis.—Length 0.50. Mahogany-brown. Form normal. Blunt at extremity.

Perfect moth.—Average length 0.38. Alar expanse ♀ 0 95, ♂ 0.75. Fore wings deep purplish-brown, more or less sprinkled with carneous. A light carneous band starts from the costa near the base, and curves towards the middle of the inner margin, which it occupies to a little beyond the beginning of the cilia, where it curves upwards towards the tip, reaching only half way up the wing. Here it is approached from above by a somewhat diffuse spot of the same color, which starts from the costa just behind the apex, and runs down to the middle of the wing.

In the plainly marked individuals there is an extra line running from the middle of the inner margin, outwardly obliquing to the middle of the wing, and then back to the inner margin a little beyond where the cilia commence, but in the great majority of specimens this mark is indistinct. Cilia light carneous. Hind wings slate-gray, with the cilia lighter. Antennæ finely annulated with the same two dark and light colors. Head, thorax and palpi light, with a sprinkling of the dark brown. Body dark, with light annulations, The species varies in the distinctness of its markings, and the light parts of the wing appear finely sprinkled with brown under the lens. Male generally smaller than female, with the antennæ proportionately a little longer.

Described from numerous bred specimens.

It seems to resemble *G. longifasciella* of Clemens, in coloration and pattern; but unfortunately our late lamented microlepidopterist, failed almost always to give the measurement of the species he described, and it is impossible to tell how much mine really resembles that species. Yet, as *longifasciella* was described from two mutilated specimens, received from A. S. Packard, jr., and as that gentleman has seen my insect and declared it an undescribed species, there can be little doubt of the fact.

Concealed within its gall, as this worm is, one would naturally suppose that it would rest unmolested from the outside world, and that no parasite could attack it through its green-walled fortress. Such however is not the case. Those oft-quoted lines, written in that spirit of ridicule, in the exercise of which Swift was always happy,

> "The little fleas that do so tease,
> Have smaller fleas that bite 'em,
> And these again have lesser fleas,
> And so *ad infinitum*,"

are as applicable to our gall-maker as to most other insects. There are indeed no less than six parasites which attack it, and from many hundreds of galls examined, I estimate that one worm out of every five is thus destroyed. As four of these parasites are new to science, and are all probably confined to this one species of insect, I will briefly describe them.

They all belong to the order HYMENOPTERA, and by far the most common of them is a little fly of a dark metallic green color, with reddish legs, which is represented highly magnified in Plate 2, Figure 6, the hair line below showing the natural size. Its larvæ infest the caterpillar in great numbers, and cause it to swell to three and four times its normal size. After they have absorbed all the juices of their victim, they form for themselves very fine brownish cocoons, which are so crammed together that they give the puffed-up worm the roughened appearance, shown at Plate 2, Figure 5, and prevent the skin from collapsing after they have left, so that it may be found within the gall at any time during the winter. These minute flies all leave the gall through a single minute hole, which must be made by one of their number. They are active little creatures, running nimbly, with their antennæ always bent towards the surface on which they travel. They have a wonderful power of jumping, and are able to leap the distance of a foot so suddenly and rapidly that they are, for the moment, scarcely visible. I have counted over 150 of them in a single caterpillar, and the mother fly must gnaw for herself a passage through the gall, and leisurely insert her batch of eggs in the inmate. This fly belongs to the *Chalcis* family, and may be called the Inflating *Chalcis* fly. The family to which it belongs has scarcely been at all studied in America, and very few species have been described. I therefore leave the species, for the present, undescribed, it apparently belonging to the genus *Pirene*.

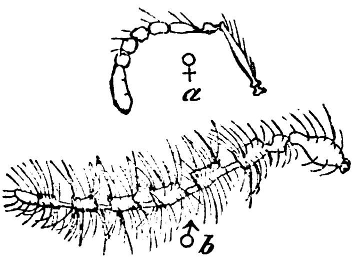
Another parasite which infests this caterpillar, is represented in the perfect state at Plate 2, Figure 9, the hair line above showing the natural size. It is a black fly, and its larva, which is often found at the bottom of the gall during the month of August, is a white, footless grub, about 0.24 long, and attenuated at the head. Some of these maggots change to pupæ and become flies in the fall of the year, while others remain in the maggot state till spring. The pupa is whitish, with the members confined and darker. This fly belongs to the same (*Chalcis*) family as the preceding, and to the genus *Eurytoma*. I name it in honor of my esteemed friend, Mr. A. Bolter, of Chicago—an entomologist, as enthusiastic as he is modest, and an indefatigable collector. When I think of the many happy hours we have spent together, and recall our many pleasant hunting grounds, the following pretty lines are ever floating in my mind:

"I long to walk by the meadow's brook,
To visit the fields and the woods once more,
To loiter long in the shady nook,
And tread the paths I have trod before;
Or, under the spreading branches to lie
And watch the clouds in the azure sky."

Annexed will be found a full description of this parasite:

Eurytoma Bolteri, N. Sp.—♀ Length 0.18. Antennæ black, not much longer than the face, perceptibly thicker towards the end, and apparently 10-jointed, though the three terminal joints are almost always confluent. Dimensions and appearance of joints, represented in the annexed Figure 97, *a*. Head and thorax rough-punctured and finely bearded with short, stiff gray hairs. Abdomen about as long as thorax, scarcely so broad, viewed from above, but wider viewed laterally; highly polished, smooth and black, the three terminal segments with minute stiff gray hairs along the sutures; visibly divided into seven segments, the four anterior ones of about equal length, the two following shorter, and the terminal one produced into a point. Legs fulvous with the *coxæ*, thighs and more or less of the shanks blackish-brown. Wings perfectly transparent, glossy, colorless, and with the nerves very faint.

[Fig. 97.]



♂ Measures but 0.14, and differs in the antennæ, being twice as long as the face, in their narrowing towards the tip and in being furnished with whorls of long hairs. The number of joints are not readily made out, and I have consequently presented at Figure 97, *b*, a magnified figure. His body is but half as wide and half as long as the thorax viewed from above, and not quite as broad as the thorax, viewed laterally; it also lacks the produced point of the ♀. His wings are also cut off more squarely and more distinctly nerved.

The third parasite which attacks our gall-maker is represented somewhat enlarged at Plate 2, Figure 7. It is an opaque black fly belonging to the true Ichneumon family and apparently to the genus *Hemiteles*. After most of the gall-makers have undergone all their transformations and escaped, some few of the galls are found still inhabited by the worm. These belated worms contain the larva of this fly, and they are somewhat smaller and paler than are the healthy ones; their life as worms being prolonged by the presence of their enemy within. During the month of September, the parasitic larva leaves the body of the caterpillar, and spins for itself, within the gall, a tough white silken cocoon, in which it remains through the winter, and from which the fly escapes during the following March or April, some of them escaping much earlier than others. This fly I have named in honor of my friend Mr. E. T. Cresson, of Philadelphia, to whom I am indebted for the generic determination of all these parasites.

Hemiteles (?) Cressonii.—♂—Length 0.25. Black, opaque, head transversely-subquadrate; face clothed with pale glittering pubescence; spot on mandibles, palpi, scape of antennæ in front and the tegulæ, white; eyes large, ovate; antennæ longer than head and thorax, slender, black; thorax closely and minutely punctured; mesothorax with a deeply impressed line on each side anteriorly; scutellum convex, closely punctured, deeply excavated at base; metathorax coarsely sculptured, truncate and excavated behind, the elevated lines sharply defined, forming an irregularly shaped central area, and a triangular one on each side of it, the outer posterior angle of which is prominent and subacute; wings hyaline, iridescent, nervures blackish, stigma large, areolet incomplete, the outer nervure wanting; legs pale honey-yellow, coxæ paler, tips of posterior femora, and their tibiæ and tasri entirely blackish; abdomen elongate ovate, flattened, petiolated, the first segment flat, gradually dilated posteriorly, somewhat shining, and indistinctly longitudinally aciculate; the two following segments opaque, indistinctly sculptured; remaining segments smooth and shining.

A fourth parasite, belonging to the same great Ichneumon family, issues from the worm and spins a white silken cocoon, in exactly the same manner as the preceding. From this cocoon at the same season of the year, escapes a fly which is also of very much the same size and appearance, but which belongs to the distinct genus *Microgaster*.

It has hitherto been undiscribed and may be known by the specific name of *gelechia.*

MICROGASTER GELECHIA—Length 0.20 ♂ ♀.—Black, clothed with a short, thin, glittering, whitish pubescence, most dense on the face, which latter is closely punctured; occiput and cheeks shining; mandibles rufopiceous; palpi whitish; eyes pubescent; antennæ as long as the body in ♂, shorter in ♀, 18-jointed; thorax shining, feebly punctured, mesothorax closely and more strongly punctured, with a deeply impressed longitudinal line on each side over base of wings; scutellum smooth and polished, the lateral groove broad, deep, arched and crenulated; metathorax opaque, densely rugose, with a sharp, central, longitudinal carina, and a smooth, flat, transverse carina at base; tegulæ testaceous, wings hyaline, iridescent, apex smoky, nervures blackish, areolet complete, subtriangular, radial nervure indistinct; legs pale honey-yellow, coxæ blackish, pale at tips, middle pair in ♀ concolorous with legs; abdomen with the two basal segments densely rugose and opaque, the remainder smooth and shining; venter more or less varied with pale testaceous.

The galls containing worms that have been victimized by either of these last two parasites are generally small and narrow, indicating that the worm has been sickly and not able to perform its functions in a proper manner, but those containing worms infested with the Inflating Chalcis-fly, first described, are of the normal size, the worm often having completed its passage-way before succumbing to its enemy.

There are two other and larger parasites which attack our little Gall-maker, the one an undescribed species of *Pimpla* and the other an undescribed species of *Ephialtes;* making in all six distinct parasites. Besides these, there is another insect which intrudes upon and often kills him. This last is the larva of some small long-horned beetle, and most likely of some species of the genus *Oberea,* as it greatly resembles the larva of *Oberea ocellata,* Hald., which I have bred from the stems of the Cottonwood. After the parent gall-moth has deposited her egg, and the young worm and its gall have acquired considerable size, the parent beetle of this larva comes along and deposits her egg higher up on the same stem, and the larva hatching from it immediately commences boring downwards till it reaches the gall, where it riots until it has crowded out the proper inhabitant and filled the gall with excrementitious and pithy *debris.* It then continues its descent till it reaches the root, where it continues boring till winter approaches, and where it hybernates in the larva state. Sometimes the gall-maker succeeds in webbing this intruder out, so that he only partially destroys the gall, while at other times the intruder does not reach the gall till the inmate has changed to the chrysalis state; but in the latter case the moth always dies in its endeavors to escape. The vacated galls of this gall-moth afford excellent winter shelter for a variety of insects and spiders, and the common Chinch bug is especially fond of taking up its winter quarters in them.

THE CHICKWEED GEOMETER, *Hæmatopis grataria*, Fabr.—Pl. 2, Figures 18, 19, 20 and 21.

(Lepidoptera Geometridæ.)

At Plate 2, Figure 18, I have figured a very common little moth which may be seen flitting over our meadows and in our gardens during the summer and fall months. It is of a delicate orange color, marked with pink, as in the figure. A number of persons have desired to know whether or not it was injurious, and what its larva fed on, and, as its transformations have been hitherto unknown, I will briefly record them.

The female moths deposit their eggs in rows of about twenty, along the edge of a leaf, or along the stem of the common chickweed (*Stellaria media*.) These eggs (see Pl. 2, Fig. 21) are not quite 0.02 of an inch long and are oval, flattened and depressed near the centre. When first laid they are yellowish-white, but change within two days to a very bright, shiny, red color, between Venetian and vermillion. These eggs hatch in a very short time, frequently within a week, into thread-like worms, with ten legs only and with the habit of looping themselves into all manner of shapes, especially into a circle. In about a month, during hot weather, they acquire their full size, when they are of the form and appearance of Plate 2, Figure 19. They are quite variable in color, being either gray, yellowish-green, or dark brown. They change to chrysalids within a slight web attached to the leaves of their food-plant, and in this state they bear the appearance of Plate 2, Figure 20, the skin being so thin that before the moth escapes the colors of the wings show distinctly through it. There are several broods during the year, and the insect may often be found in all its different states at one and the same time. It probably passes the winter in either the larva or egg state, for I have taken both eggs and half grown larvæ in the beginning of November. In the larva and chrysalis state it is not easily detected, on account of its small size and of its assimilating the color of the food-plant. The larva has furthermore the habit of jerking itself away to a considerable distance when disturbed, especially while it is young.

Hæmatopis grataria, Fabr.—*Larva*—Average length 0.85. Color quite variable; either pale yellowish-green, deep rufous with an orange tint, or of a mixture of gray and cream-color. Minutely punctate all over. Segments 1, 2 and 3, extremely short; 4, longest and widest, having two wrinkles each side, with a dark depression between them; 5, 6, 7 and 8, of equal length; 9, 10 and 11, short, the two former also somewhat wider than the other. Dorsum dark, with a lighter middle line, and a light, somewhat irregular subdorsal line which converges anteriorly and diverges posteriorly of each segment; two dark spots anteriorly each side of the middle line. Sides more or less wrinkled, lighter than dorsum and with a light longitudinal ridge below. Venter variegated with longitudinal marks, and shaded outwardly with deep olive-green in strong contrast with the lateral light ridge. Stigmata minute, black, and placed on an oval swelling at the anterior portion of the segment. Head of the same color as body, with a dark line, edged each side with white, continuing from the thoracic segments.

Chrysalis.—(Plate 2, Fig. 20.) Length, 0.50. Wing sheaths and tip of abdomen pale buff, the middle of the abdomen very light yellowish-green. A purplish dorsal line. Obliquely truncated at the head, having a somewhat triangular appearance, the ventral angle being lengthened i slightly bifurcate snout. Anal segments quite attenuated, the extremity being also slightly cated. Stigmata small, black and distinct.

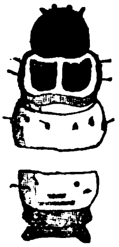
THE THISTLE PLUME,—*Pterophorus carduidactylus*, N. Sp., Pl. 2, Figs. 13 and 14.

(Lepidoptera Alucitidæ.)

Having already sketched the history of the Grape Plume, page 137, the larva of which attacks the Grape vine, I will now give the history of another species of the same *genus* whose larva infests the common Thistle (*Cersium lanceolata*) in order to show how very dissimilar two larvæ may be, which belong to the same genus and greatly resemble each other in the perfect state.

During the month of May the heads of the above named thistle may frequently be found drawn together by silken threads, with some of the leaves frequently dead. On pulling this webbed mass apart from eight to a dozen thick smooth worms may be found, which are of a light straw color with rows of black spots, and the head and tail marked as in the accompanying figure. These worms are found of different sizes in the same head, which would indicate that the parent moth either deposits her eggs at different intervals in the same place or that the eggs hatch out irregularly. Towards the end of May they change to pupæ within the burrow which the worm inhabited; these pupæ being of a dull yellow color, without polish, and resembling the pupæ of some long-legged Crane fly (*Tipula*) rather than a moth—see Pl. 2, Fig. 14. In just one week after they have thus changed, the moths escape. This moth, which is represented at Plate 2, Figure 13, is of a tawny yellow color, with a prominent triangular dark spot on the outer third of the front wing, running from the front edge. As it differs from all hitherto described North American species, it may appropriately be called the Thistle Plume.

[Fig. 98.]



Pterophorus carduidactylus, N. Sp.—*Larva.*—Average length 0.60. Largest in the middle of body, tapering thence each way. Color light straw-yellow—greener when young. Somewhat darker, partly translucent, dorsal, subdorsal and stigmatal lines. Two lateral rows of black spots, the lower spots rather smaller and placed behind the upper ones. A third row above these, and others along the back, but so small that they are generally imperceptible with the naked eye, except on the thoracic segments, being especially distinct on segment 2. Head small, black, sometimes inclining to brown. Cervical shield black, divided longitudinally in the middle by a lighter line. Caudal plate also black. Segment 11, besides the spots above mentioned, has two transverse black marks, the posterior one the largest. Thoracic legs black, the others of the same color as the body.

Described from 12 specimens.

Pupa.—Average length 0.45. Of form of Plate 2, Figure 14. Soft, dull yellow, with a lateral dusky line, each side of dorsum, and another, less distinct each side of venter. Also dusky about the head and wing-sheaths.

Perfect insect.—Length 0.45; alar expanse 0.80. Front wings bifid, the cleft reaching not much more than ¼ of wing; tawny yellow, with a distinct dark brown triangular spot running from costa to the base of cleft—sometimes a little below it—its posterior margin with a slight concave curve. Three dusky, diffuse longitudinal spots, one placed on the basal third of the wing at costa and frequently reaching along the costa to the triangular spot; one near the interior margin, a little nearer to the base of wing than the last, and one on the outer third of the interior margin. Two light-colored transverse lines across the end of wing, one very near and parallel with posterior margin, the other bordering the triangular spot behind, and curving across the lower lobe towards posterior angle. The space between these two light lines usually darker than the ground-color. Fringes dark with a light margin. Hind wings trifid, the upper cleft reaching a little beyond the middle, the lower one to the base of wing. Color ashy-brown, the lower lobe produced into a dark angular spot about their middle posteriorly. Antennæ, palpi, head, thorax, and body, tawny yellow; legs of the same color with the exception of the tarsi, which are almost white, with alternate dark brown spots, the spines being black, with dusky tips.

ERRATA.

Page 8, line 21, for "being" read "were."
Page 10, line 1, for "Figure 3, $\underline{3}$" read "Figure 3, $\underline{2}$."
Page 12, line 20, for "last" read "1866."
Page 12, line 3 from bottom, after "February," add "(1867)."
Page 31, line 15, for "37°" read "38°."
Page 47, line 16, for "far" read "for."
Page 114, line 1, after "insect" read "(*Strietrus frimbriatus*, Say)."
Page 120, line 30, after "Cottonwood" read "(*Pemphigus vagabundus*, Walsh)."
Page 133, line 24 from bottom, for "preceding insect" read "Grape curculio."
Page 134, line 3 from bottom, for "Part V" read "Part VI."
Page 142, under the heading, add "(Lepidoptera, Tortricidæ)."
Page 166, under the heading, add "(Lepidoptera, Tineidæ)."

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